TECHNICAL REVIEW AND EVALUATION OF APPLICATION FOR AIR QUALITY PERMIT NO. 1000992

I. INTRODUCTION

This operating permit is issued to North Star Steel Arizona, the Permittee, for operation of the North Star Steel Arizona steel manufacturing mini-mill, located approximately four miles south-southwest of the town of Kingman in Mohave County, Arizona. The steel mini-mill, as proposed to be modified, will recycle steel scrap to produce up to 800,000 tons (short) per year of steel reinforcing bar, steel wire, and bar and steel wire products.

A. Company Information

Facility Name: North Star Steel Arizona

Facility Address: 3000 Highway 66 South
Kingman, Arizona 86413

B. Background

The subject facility was originally permitted under air pollution Installation Permit No. 15-1232, issued August 18, 1993. The Installation Permit included emission limits and limitations on operating conditions to ensure that the facility remained a non-major source under Prevention of Significant Deterioration (PSD) regulations. The permit also included performance testing requirements to demonstrate compliance with permitted emission limits.

The facility commenced commercial operation in 1996 and conducted the required performance testing in 1998. Performance test results showed that the facility could not comply with certain permit terms and conditions and that the facility is a major source. On July 29, 1998, North Star Steel Arizona and Arizona Department of Environmental Quality (ADEQ) entered into a consent order (A-86-98) requiring the Company to prepare and submit Title V and PSD permit applications.

The Title V and PSD permit applications were deemed complete by ADEQ on October 27, 1998 and March 15, 1999, respectively. The proposed Class I permit addresses both of these applications.

C. Attainment Classification

The air quality control region in which the subject facility is located either is unclassified or is classified as being in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants: particulate matter less than 10 microns (PM-10), nitrogen dioxide (NO_2), sulfur oxides (SO_2), carbon monoxide (CO), lead (Pb) and ozone (O_3).

II. PROCESS DESCRIPTION

The subject facility recycles steel scrap to produce steel reinforcing bar, steel wire, and bar and steel wire products. The steel production capacity of the facility is 120 tons per hour. It has only one operating scenario and operates 24 hours per day, 365 days per year. If the permit is issued as proposed, the facility will be permitted to produce a maximum of 800,000 tons of steel per year.

Scrap material is unloaded from rail cars and from trucks, by dumping or using overhead cranes equipped with magnets, into piles in an unpaved scrap yard. Overhead cranes are also used to load scrap from the piles in the scrap yard into buckets that are dumped into a bottom-tapping direct-current electric arc shaft furnace (EASF). The EASF, which is a type of electric arc furnace (EAF) with significant differences from conventional alternating-current EAF's, is the primary piece of process equipment and the primary source of emissions at the subject facility. Following scrap addition, fluxing agent and carbon material are added and the EASF roof is closed. The direct-current electrode is lowered into the furnace to begin melting the scrap. Slag is removed from the furnace through a door in the furnace wall.

Natural gas-fired burners are used to dry and to preheat the refractory materials in ladles and in the tundish preheater. The molten steel is poured through a tap-hole in the furnace wall into a preheated ladle, which is conveyed to the ladle metallurgical facility (LMF). The molten steel in the ladle is analyzed, the chemistry adjusted with alloys or other additives as necessary, and the molten steel is heated with electrodes.

The ladle is then moved from the LMF, and the molten steel charged from the ladle into a preheated tundish and then into the continuous caster. The steel billets produced by the caster are cut using a torch cut-off machine. The billets are either hot-charged directly into the reheat furnace or are stored in a billet storage yard before being cold-charged into the reheat furnace.

The reheat furnace heats steel billets to the proper temperature for malleability for rolling into finished products. This furnace is a walking-beam type furnace with five heating zones and the capability to charge and discharge billets through its side by means of roller tables. It fires exclusively natural gas, with a maximum heat input capacity of 74.0 million Btu per hour.

Add-on pollution control equipment at the subject facility includes a direct-shell evacuation control (DEC) system and a natural gas-fired, enhanced secondary post-combustion chamber serving the EASF exhaust. In addition, a fabric filter baghouse serves the melt shop exhaust, which includes the EASF and LMF as well as the ladle and tundish drying and preheating operations.

III. EMISSIONS

A. Emissions Summary

Table III-A presents a summary of the maximum allowable hourly and annual emissions from the subject facility. In addition, the table shows the annual potential-to-emit of the facility, without considering operational limitations.

Table III-A. Emissions Summary

Emission Unit	**Pollutant**	**Allowable** (lb/hr)	**Allowable** (tons/yr)	**Test Data** (tpy)
Meltshop	PM	15.4	67.5	n/a
	PM_{10}	44.5	195	n/a
	SO_2	24.0	105	n/a
	NO_X	126	551	n/a
	CO	725	3,175	n/a
	VOC	42.3	185	n/a
	Lead	0.3	1.3	n/a
Reheat Furnace	PM	0.55	2.41	n/a
	PM_{10}	0.55	2.41	n/a
	SO_2	0.04	0.19	n/a
	NO_X	7.40	32.4	n/a
	CO	2.22	9.72	n/a
	VOC	0.10	0.44	n/a
Cooling Towers	PM	3.22	14.1	n/a
	PM_{10}	1.61	7.05	n/a
Paved Roads	PM	3.13	12.5	n/a
	PM_{10}	0.61	2.44	n/a
Unpaved Roads	PM	15.7	61.2	n/a
	PM_{10}	4.09	15.9	n/a
Facility-wide Total	PM	38.0	158	n/a
	PM_{10}	51.4	223	n/a
	SO_2	24.1	105	n/a
	NO_X	133	584	n/a
	CO	727	3,185	n/a
	VOC	42.4	186	n/a
	Lead	0.3	1.3	n/a

B. Emission Calculations and Basis

1. PM from melt shop baghouse

   a. Reference:
      i) Baghouse operates 8,760 hours per year.
      ii) Exhaust PM concentration, based on the BACT determination, is 0.0018 grains per dry standard cubic foot exhaust gas (gr/dscf).
      iii) Exhaust gas flow rate is 1.2 million actual cubic feet per minute (acfm).
      iv) Exhaust gas moisture content is 1.5 percent.
      v) Exhaust gas temperature is 165 EF.
      vi) Standard conditions are 68 EF and 29.92 in. Hg, as defined by EPA at 40 CFR 60.2. Standard conditions are not defined in A.A.C. R18-2.

   b. Calculation of hourly PM emission rate from melt shop baghouse:

$$= \frac{1{,}200{,}000\,acf}{\min} x \frac{60\min}{hr} x \frac{(460+68)scf}{(460+165)acf} x \frac{0.985dscf}{scf} x \frac{0.0018gr}{dscf} x \frac{1lb}{7{,}000gr} = 15.4\frac{lbPM}{hr}$$

where:

acf/min	=	actual cubic feet per minute
min/hr	=	minutes per hour
scf/acf	=	standard cubic foot per actual cubic foot
dscf/scf	=	dry standard cubic foot per standard cubic foot
gr/dscf	=	grains per dry standard cubic foot
lb/gr	=	pound per grain
lb/hr	=	pound per hour

   c. Calculation of annual PM emission rate from melt shop baghouse:

$$= \frac{15.4lb}{hr} x \frac{8{,}760hr}{yr} x \frac{1ton}{2{,}000lb} = 67.5\frac{tonPM}{yr}$$

where:

lb/hr	=	pound per hour
hr/yr	=	hours per year
ton/lb	=	tons per pound
ton/yr	=	tons per year

2. PM_{10} from melt shop baghouse

a. Reference:

i) Same as for PM above, except that the exhaust PM_{10} concentration is 0.0052 gr/dscf, based on the BACT analysis.

3. Lead (Pb) from melt shop baghouse

a. Reference:

i) Pb emissions are 1.95 percent of total particulate matter, based on the BACT determination

ii) Same as (ii) through (vii) for particulate matter above.

b. Calculation of hourly emission rate:

$$= \frac{15.4 lbPM}{hr} x \frac{0.0195 lbPb}{lbPM} = 0.300 \frac{lbPb}{hr}$$

c. Calculation of annual emission rate:

$$= \frac{67.5 tonPM}{yr} x \frac{0.0195 tonPb}{tonPM} = 1.32 \frac{tonPb}{yr}$$

4. Sulfur dioxide (SO_2) / nitrogen oxide (NO_X) / volatile organic compounds (VOCs) / carbon monoxide (CO) from electric arc shaft furnace (EASF) and ladle metallurgical facility (LMF)

a. Reference:

i) Combined emission factor for SO_2 from EASF & LMF is 0.20 lb per ton of steel produced, based on the BACT determination.

ii) Combined emission factor for NO_X from EASF & LMF is 1.0 lb per ton of steel produced, based on the BACT determination.

iii) Combined emission factor for VOC from EASF & LMF is 0.35 lb per ton of steel produced, based on the BACT determination.

iv) Combined emission factor for CO from EASF & LMF is 6.0 lb per ton of steel produced, based on the BACT determination.

v) Maximum steel throughput for the EASF and LMF is 120 tons per hour and 800,000 tons per year.

b. Example hourly emission calculation for EASF and LMF – SO_2:

$$= \frac{120 tons\_steel}{hr} x \frac{0.20 lbSO_2}{ton\_steel} = 24.0 \frac{lbSO_2}{hr}$$

c. Example annual emission calculation for EASF and LMF – SO_2:

$$= \frac{24.0 lb}{hr} x \frac{8{,}760 hr}{yr} x \frac{1 ton}{2{,}000 lb} = 105 \frac{tonPM}{yr}$$

d. Same calculation procedures yield 120 lb/hr & 526 tons/yr NO_X; 42.0 lb/hr & 184 tons/yr VOC; and 720 lb/hr & 3,154 tons/yr CO.

4. SO_2 / NO_X / VOC / CO from combustion sources (2 tundish preheaters, 2 ladle preheaters, tundish dryer, 2 ladle dryers)

a. Reference:
   - i) AP-42 emission factors for natural gas combustion in "small boilers" are representative of the proposed combustion sources.
   - ii) Total heat input capacities of combustion sources are 9 MMBtu/hr for tundish preheaters, 28 MMBtu/hr for ladle preheaters, 3 MMBtu/hr for tundish dryer and 20 MMBtu/hr for ladle dryers.
   - iii) Each of the combustion sources venting to melt shop baghouse operates 8,760 hours per year.

b. Example hourly emission calculation for small combustion sources – SO_2:

$$= \frac{60 MMBtu}{hr} x \frac{0.00059 lbSO_2}{MMBtu} = \frac{0.0353 lbSO_2}{hr}$$

c. Example annual emission calculation for small combustion sources – SO_2:

$$= \frac{0.0353 lbSO_2}{hr} x \frac{8{,}760 hr}{yr} x \frac{1 tonSO_2}{2{,}000 lbSO_2} = \frac{0.155 tons}{yr}$$

d. Same calculation procedures yield 5.88 lb/hr & 25.8 tons/yr NO_X;

0.324 lb/hr & 1.42 tons/yr VOC; and 4.94 lb/hr & 21.6 tons/yr CO.

5. SO_2 / NO_X / VOC / CO from melt shop baghouse

a. Reference:

i) SO_2 / NO_X / VOC / CO emissions from melt shop baghouse include emissions from electric arc shaft furnace, ladle metallurgical facility, and combustion sources (2 tundish preheaters, 2 ladle preheaters, tundish dryer, 2 ladle dryers).

b. Example hourly emission calculation for melt shop baghouse – SO_2:

$$= \frac{24.0 lbSO_2}{hr}(from\_EASF/LMF) + \frac{0.0353 lbSO_2}{hr}(from\_combustion) = 24.0\frac{lbSO_2}{hr}$$

c. Example annual emission calculation for melt shop baghouse – SO_2:

$$= \frac{105 tonSO_2}{yr}(from\_EASF/LMF) + \frac{0.155 tonSO_2}{yr}(from\_combustion) = 105\frac{tonSO_2}{yr}$$

d. Same calculation procedures yield 126 lb/hr & 551 tons/yr NO_X; 42.3 lb/hr & 185 tons/yr VOC; and 725 lb/hr & 3,175 tons/yr CO.

6. Reheat furnace

a. Reference:

i) AP-42 emission factors for PM, PM_{10}, and SO_2 from natural gas combustion in "small boilers" are representative of the proposed reheat furnace sources.

ii) Emission factor for CO from reheat furnace is 0.03 lb/MMBtu, based on the BACT determination.

iii) Emission factor for NO_X from reheat furnace is 0.10 lb/MMBtu, based on the BACT determination.

iv) Emission factor for VOC from reheat furnace is 0.0014 lb/MMBtu, based on the BACT determination.

v) Total heat input capacity of reheat furnace is 74.0 MMBtu/hr.

vi) Reheat furnace operates 8,760 hours per year.

b. Example hourly emission calculation for reheat furnace – SO_2:

$$= \frac{74.0\,MMBtu}{hr} x \frac{0.00059\,lbSO_2}{MMBtu} = 0.044 \frac{lbSO_2}{hr}$$

c. Example annual emission calculation for reheat furnace – SO_2:

$$= \frac{0.044\,lbSO_2}{hr} x \frac{8{,}760\,hr}{yr} x \frac{1\,tonSO_2}{2{,}000\,lbSO_2} = 0.19 \frac{tonSO_2}{yr}$$

d. Same calculation procedures yield 0.55 lb/hr & 2.41 tons/yr PM; 0.55 lb/hr & 2.41 tons/yr PM_{10}; 7.40 lb/hr & 32.4 tons/yr NO_X; 0.10 lb/hr & 0.44 tons/yr VOC; and 2.22 lb/hr & 9.72 tons/yr CO.

7. Cooling towers

a. Reference:

i) PM_{10} is equivalent to 50% of total particulate matter (PM) for each tower.

ii) Cooling towers operate 8,760 hours per year.

iii) Maximum circulating water flow rate for indirect cooling water tower is 34,500 gallons (gal) per minute.

iv) Maximum circulating water flow rate for direct cooling water tower is 14,000 gallons per minute.

v) Solids content (including total dissolved solids plus total suspended solids) of circulating water in the indirect cooling water tower is a maximum of 8.0 grams per liter.

vi) Solids content (including total dissolved solids plus total suspended solids) of circulating water in the direct cooling water tower is a maximum of 11.0 grams per liter.

vii) Total liquid drift factor for indirect cooling water tower is 0.002 percent, or 0.00002 gallons drift per gallon circulated water, based on the BACT determination

viii) Total liquid drift factor for direct cooling water tower is 0.0006 percent, or 0.000006 gallons drift per gallon circulated water, based on the BACT determination

b. Example hourly emission calculation for indirect cooling water tower:

$$= \frac{34{,}500 gal\_water}{\min} x \frac{0.00002 gal\_drift}{gal\_water} x \frac{3.785 liter\_drift}{gal\_drift} x \frac{8.0 gPM_{10}}{liter\_drift} x \frac{lbPM_{10}}{453.59 g\_drift} x \frac{60 \min}{hr} = 2.76 \frac{lbPM_{10}}{hr}$$

c. Example annual emission calculation for indirect cooling water tower:

$$= \frac{2.76 lbPM_{10}}{hr} x \frac{8{,}760 hr}{yr} x \frac{1 tonPM_{10}}{2{,}000 lbPM_{10}} = 12.1 \frac{tonPM_{10}}{yr}$$

d. PM_{10} emission rates for the indirect cooling water tower are 50% of the above values, or 1.38 lb/hr & 6.05 tons/yr.

e. Same calculation procedures yield 0.463 lb/hr & 2.03 tons/yr PM and 0.231 lb/hr & 1.01 tons/yr PM_{10} from direct cooling water tower.

8. Vehicle Traffic on Paved Roads

a. Reference:
   i) AP-42 emission calculation methodology for particulate matter nominally 30 microns (PM_{30}) and PM_{10} from vehicle traffic on paved roads is representative of PM and PM_{10} emissions from traffic on paved roads at the proposed facility.
   ii) Vehicle mileage at the facility includes 50,000 miles per year from employee vehicles (average weight 2.4 tons); 5,632 miles per year from unloaded trucks (average weight 15 tons); and 5,632 miles per year from loaded trucks (average weight 40 tons).
   iii) Vehicle miles traveled (VMT) occur equally over 8,000 hours per year. (This assumption, made by the applicant, is probably not accurate because employee vehicles' mileage occurs sporadically. However, since the emission rate is used primarily for modeling impacts against 24-hr and annual standards, the effect of this inaccuracy is minimal.)
   iv) Overall control efficiency of 50 percent is achieved by sweeping.

b. Silt loading (sL) value is 9.7 grams per square meter based on Table 13.2.1-1 of the most recent (October 1997) version of AP-42 section 13.2.1 for vehicle traffic on paved roads.

c. PM_{10} particle size multiplier is 0.016 based on Table 13.2.1-3 of the most recent (October 1997) version of AP-42 section 13.2.1 for vehicle traffic on paved roads.

d. Calculation of average vehicle weight (W):

$$= \frac{(50{,}000 miles \times 2.4 tons) + (5{,}632 miles \times 15 tons) + (5{,}632 miles \times 40 tons)}{50{,}000 miles + 5{,}632 miles + 5{,}632 miles} = 7.01 tons$$

e. Example uncontrolled annual emission calculation for PM_{10} from vehicle traffic on paved roads:

$$= \frac{0.016 lbPM_{10}}{VMT} x \frac{61{,}264 VMT}{yr} x \left(\frac{(sL = 9.7)}{2}\right)^{0.65} x \left(\frac{(W = 7.01)}{3}\right)^{1.5} x \frac{tonPM_{10}}{2{,}000 lbPM_{10}} = 4.89 \frac{tonsPM_{10}}{yr}$$

f. Example uncontrolled hourly emission calculation for PM_{10} from vehicle traffic on paved roads:

$$= \frac{4.89 tonPM_{10}}{yr} x \frac{yr}{8{,}000 hr} x \frac{2{,}000 lbPM_{10}}{tonPM_{10}} = 1.22 \frac{lbPM_{10}}{hr}$$

g. Applying 50 percent control efficiency yields controlled emission rates of 0.611 lb/hr & 2.44 tons/yr PM_{10} from vehicle traffic on paved roads.

h. Same calculation procedures, using PM_{30} particle size multiplier of 0.082 lb PM_{30} per VMT from Table 13.2.1-1 of the AP-42 section, yield controlled emission rates of 3.13 lb/hr & 12.5 tons/yr PM from vehicle traffic on paved roads.

9. Vehicle Traffic on Unpaved Roads

a. Reference:
   i) AP-42 emission calculation methodology for PM_{30} and PM_{10} from vehicle traffic on unpaved roads is representative of emissions from traffic on unpaved roads at the proposed facility.
   ii) Vehicle mileage at the facility includes 58,400 miles per year from service vehicles (average weight 4 tons); 3,320 miles per year from empty slag trucks (average weight 17 tons); 12,760 miles per year from other empty trucks (average weight 15 tons); and 16,080 miles per year from loaded trucks (average weight 40 tons), for a total of 90,560 vehicle miles per year.
   iii) Vehicle miles traveled occur equally over 8,000 hours per year.
   iv) Average surface material moisture content on days without precipitation is 0.2 percent (default value from the most recent (September 1998) version of AP-42 section 13.2.2 for vehicle traffic on unpaved roads).
   v) The Kingman site has an average of 324 dry days per year.
   vi) Overall control efficiency of 85 percent is achieved by spraying a chemical dust suppressant.

b. Surface material silt content (s) is 6.0 percent based on Table 13.2.2-2 of the most recent (September 1998) version of AP-42 section 13.2.2 for vehicle traffic on unpaved roads.

c. Calculation of average vehicle weight:

$$= \frac{(58{,}400 miles \times 4 tons) + (3{,}320 miles \times 17 tons) + (12{,}760 miles \times 15 tons) + (16{,}080 miles \times 40 tons)}{58{,}400 miles + 3{,}320 miles + 12{,}760 miles + 16{,}080 miles} = 12.4 \frac{tonsPM_{10}}{yr}$$

d. Example annual uncontrolled emission calculation for PM_{10} from vehicle traffic on paved roads:

$$\frac{\frac{2.6 lbPM_{10}}{VMT} x \frac{90{,}560 VMT}{yr} x \left(\frac{(s = 6)}{12}\right)^{0.8} x \left(\frac{(W = 12.4)}{3}\right)^{0.4}}{\left(\frac{(M = 0.2)}{0.2}\right)^{0.3}} x \frac{324 dry\_days}{365 dry\_days} x \frac{tonPM_{10}}{2{,}000 lbPM_{10}} = 106 \frac{tonPM_{10}}{yr}$$

e. Example hourly emission calculation for PM_{10} from vehicle traffic on unpaved roads:

$$= \frac{106 ton PM_{10}}{324 days} x \frac{day}{24 hr} x \frac{2{,}000 lb PM_{10}}{ton PM_{10}} = 27.2 \frac{lb PM_{10}}{hr}$$

f. Applying 85 percent control efficiency yields emission rates of 4.09 lb/hr & 15.9 tons/yr PM_{10} from vehicle traffic on unpaved roads.

g. Same calculation procedures, using PM_{30} particle size multiplier of 10 lb PM_{30} per VMT from Table 13.2.2-2 of the AP-42 section, yield controlled emission rates of 15.7 lb/hr & 61.2 tons/yr PM from vehicle traffic on unpaved roads.

IV. APPLICABLE REQUIREMENTS

A. Applicable Permitting Requirements

As noted in Section I.B of this technical review summary, the subject facility is a major source for the purposes of both A.A.C. R18-2-302 (implementing Title V of the Federal Clean Air Act) and A.A.C. R18-2-406 (implementing Prevention of Significant Deterioration (PSD) regulations under Title I of the Federal Clean Air Act).

The facility is a major source under A.A.C. R18-2-302 because it has the potential to emit (i.e., allowable emissions) greater than 100 tons per year of six pollutants regulated under the Clean Air Act: PM, PM_{10}, NO_X, CO, SO2, and VOC. As a major source, the facility is subject to all requirements under A.A.C. R18-2-302.

The facility is a major source under A.A.C. R18-2-406.A because it has the potential to emit (PTE) greater than 100 tons per year of the six pollutants listed above. In addition, construction of the facility involved a significant net emissions increase of lead (Pb). Thus, the facility is subject to all requirements of A.A.C. R18-2-406.A for these seven pollutants.

The North Star Steel mini-mill PTE and the corresponding major source thresholds and significant levels are as follows:

Table IV-A-1. Potential-to-Emit and Applicability Thresholds

Pollutant	Potential-to-Emit (tons per year)	Major / Significant (tons per year)	Major Source?	PSD Applicable?
PM	158	100 / 25.0	yes	yes
PM_{10}	223	100 / 15.0	yes	yes
SO_2	105	100 / 40.0	yes	yes
NO_X	584	100 / 40.0	yes	yes
CO	3,185	100 / 100.0	yes	yes
VOC	186	100 / 40.0	yes	yes
Lead	1.3	100 / 0.6	no	yes

1. Title V

As a Title V major source, the facility is required by the Arizona Administrative Code [A.A.C.] to obtain a Class I permit. The proposed permit meets all requirements for a Class I permit as set forth in Title 18, Chapter 2, Article 3 [A.A.C. R18-2-302.B.1]. Article 3 requires that the permit contain periodic monitoring requirements adequate to assure compliance with all applicable emission limitations and standards. The periodic monitoring requirements established in the proposed permit are described in detail in Section V.B herein.

2. PSD

As a PSD major source, the facility is required by A.A.C. R18-2-406 to obtain a PSD permit. The proposed permit meets all applicable requirements for a PSD permit as set forth in A.A.C. R18-2-406 through -410. These requirements include the application of Best Available Control Technology (BACT) and the analysis of impacts, including secondary growth impacts on ambient air quality, visibility, soils, and vegetation. The BACT analysis is discussed in detail in Section VI herein, and the impacts analyses are discussed in detail in Section VII herein.

B. Other Applicable Requirements

1. New Source Performance Standards (NSPS)

40 Code of Federal Regulations (CFR) part 60 subpart AAa, *Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 7, 1983*, is applicable to the EASF at the subject facility. The applicable requirements associated with this standard, including the applicable provisions of the NSPS *General Provisions* at subpart A, include the following:

§60.7, "Notification and Record Keeping," requires submittal of notification of such activities as construction initial startup, malfunctions, and periods of excess emissions. These requirements are incorporated into the proposed permit.

§60.8, "Performance Tests," requires the conduct of performance tests to demonstrate compliance with applicable emission standards under subpart AAa, and establishes requirements for testing facilities, test conditions, notification of scheduled testing, and data reduction procedures. These requirements are incorporated into the proposed permit.

§60.11, "Compliance with Standards and Maintenance Requirements," establishes procedures for demonstrating compliance with applicable opacity standards under subpart AAa. These procedures are incorporated into the proposed permit.

§60.272a, "Standard for Particulate Matter," establishes the following limits:

- A particulate matter emission concentration limit of 0.0052 gr/dscf in the melt shop baghouse exhaust gases. For the purposes of streamlining and improving clarity, this limit is not included in the proposed permit, as the PM BACT limit of 0.0018 gr/dscf is more stringent.

- An opacity limit of 3 percent on visible emissions from the melt shop baghouse exhaust. This limit is equivalent to BACT and is included in the proposed permit.
- An opacity limit of 6 percent on visible emissions from the melt shop, other than melt shop baghouse exhaust gases, and attributable to the operation of the EASF. This limit is equivalent to BACT and is included in the proposed permit.
- An opacity limit of 10 percent on visible emissions from the handling of dust from the melt shop baghouse. This limit is less stringent than the BACT limit of zero opacity and is therefore not included in the proposed permit.

§60.273a, "Emission Monitoring," requires that visible emissions evaluations are performed by a certified observer at least once per day. This requirement is incorporated into the proposed permit.

§60.274a, "Monitoring of Operations," requires monitoring of furnace static pressure and other direct-shell evacuation control (DEC) system operating parameters. The specific requirements, which are incorporated into the proposed permit, include the following:

- §60.274a(b) requires either 1) checking and recording the DEC system fan motor amperes and damper position at least once per shift; 2) installing, calibrating and maintaining a monitoring device that continuously records the volumetric flow rate through each separately ducted hood within the DEC system; or 3) installing, calibrating and maintaining a monitoring device that continuously records the volumetric flow rate into the melt shop baghouse and also checking and recording the DEC system damper position at least once per shift. North Star Steel will utilize the first of these three monitoring options.
- §60.274a(b) also requires that the furnace static pressure be checked and recorded at least once per shift.
- §60.274a(f) requires that the pressure monitoring device used to comply with §60.274a(b) have an accuracy of ±5 mm of water gauge over its normal operating range and that it be installed in a location in the EASF or in the DEC system duct, prior to the introduction of ambient air, such that reproducible results will be obtained.
- §60.273a(d) allows once-per-day melt shop opacity observations in lieu of the once-per-shift furnace static pressure monitoring and recording requirement under §60.274a(b). Performance of opacity observations at the melt shop must be done in accordance with EPA Method 9, at least once per day, while the EASF is operating in the melting and refining period. This provision is incorporated into the proposed permit.

§60.275a, "Test Methods and Procedures," establishes process operating conditions and test methods for the testing requirements under §60.8. These requirements are incorporated into the proposed permit.

§60.276a, "Recordkeeping and Reporting Requirements," establishes recordkeeping and reporting requirements related to the monitoring and testing performed under §§60.273a, 60.274a and 60.275a. These requirements are incorporated into the proposed permit.

2. Compliance Assurance Monitoring

This regulation requires monitoring for the melt shop baghouse and the enhanced secondary post-combustion chamber. The CAM plan is discussed in detail in Section V.A herein.

3. Protection of Stratospheric Ozone

40 CFR part 82 codifies regulations pursuant to Title VI of the Federal Clean Air Act. Subpart B of this part, *Servicing of Motor Vehicle Air Conditioners,* and subpart F, *Recycling and Emissions Reduction,* are applicable to the subject facility. The applicable requirements associated with these regulations include the following:

§82.34, "Prohibitions," sets forth procedures to be followed when servicing motor vehicle air conditioners containing Class I or Class II ozone depleting substances. These requirements are incorporated into the proposed permit.

§82.36, "Approved Refrigerant Recycling Equipment," establishes requirements for the design and use of equipment used to recover or recycle refrigerant from motor vehicle air conditioners utilizing Class I or Class II substances. These requirements are incorporated into the proposed permit.

§82.42, "Certification, Recordkeeping and Public Notification Requirements," establishes certification and recordkeeping requirements for persons who perform service on motor vehicle air conditioners utilizing Class I or Class II substances. These requirements are incorporated into the proposed permit.

§82.156, "Required Practices," sets forth procedures to be followed when opening appliances containing Class I or Class II ozone depleting substances. These requirements are incorporated into the proposed permit. (This section also establishes leak repair requirements for commercial and industrial refrigeration units utilizing Class I or Class II substances, but the North Star Steel facility includes no such units.)

§82.158, “Standards for Recycling and Recovery Equipment,” establishes requirements for the design and use of equipment used to recover or recycle refrigerant from appliances utilizing Class I or Class II substances. These requirements are incorporated into the proposed permit.

§82.161, “Technician Certification,” establishes requirements for persons who perform maintenance, service or repair on appliances utilizing Class I or Class II substances. These requirements are incorporated into the proposed permit.

§82.166, “Reporting and Recordkeeping Requirements,” establishes recordkeeping and reporting requirements related to the disposal of appliances utilizing Class I or Class II substances. These requirements are incorporated into the proposed permit. (This section also establishes requirements relating to the leak repair requirements under §82.156 for commercial and industrial refrigeration units utilizing Class I or Class II substances, but the North Star Steel facility includes no such units.)

4. Emissions from Non-Point Sources

Article 6 of A.A.C. R18-2 establishes restrictions on emissions from non-point sources, including the following:

A.A.C. R18-2-602 prohibits open outdoor fires;

A.A.C. R18-2-604 through 607 restrict fugitive dust emissions from such sources as open areas, parking lots, roadways and streets, material handling operations and storage piles; and

A.A.C. R18-2-609 limits opacity of visible emissions from non-point sources to 40 percent.

These provisions are incorporated into the proposed permit.

5. Existing Stationary Source Performance Standards

Article 7 of A.A.C. R18-2 establishes restrictions on emissions from stationary sources, including the following:

A.A.C. R18-2-702.B limits opacity of visible emissions from stationary point sources (not otherwise regulated) to 40 percent. This standard has not been included in the proposed permit because it is less stringent than the permit limits representing BACT on the affected equipment.

A.A.C. R18-2-703 establishes emission standards for fossil fuel-fired steam generators and other fuel-burning equipment. No equipment at the North Star Steel facility is subject to these emission standards. (The reheat furnace and other natural gas-fired equipment in the melt shop area are classified as fossil fuel-fired industrial and commercial equipment and, thus, are subject to emission standards at A.A.C. R18-2-724.)

A.A.C. R18-2-713 establishes emission standards for basic oxygen process furnaces at iron and steel plants. No equipment at the North Star Steel facility meets the applicability criteria for these emission standards.

A.A.C. R18-2-717 establishes emission standards for existing electric arc furnaces and associated dust-handling equipment. As the EASF and its associated dust-handling equipment are subject to the NSPS for electric arc furnaces (40 CFR 60 subpart AAa – see Section IV.B.1 herein), which is incorporated by reference at A.A.C. R18-2-901.34, they are not existing sources. Thus, no equipment at the North Star Steel facility is subject to this regulation.

A.A.C. R18-2-719 establishes emission standards for internal combustion engines. These standards include limits on particulate matter emission rate, sulfur dioxide emission rate and opacity of visible emissions. Other than two emergency generators, which are insignificant activities, no equipment at the North Star Steel facility meets the applicability criteria for these standards.

A.A.C. R18-2-724 establishes emission standards for fossil fuel-fired industrial and commercial equipment. These standards are applicable to the reheat furnace and other natural gas-fired equipment in the melt shop area at the North Star Steel facility. (While the products of combustion in these sources do come into direct contact with process materials, the sources are classified as fossil fuel-fired industrial and commercial equipment because said contact is not expected to affect the products of combustion.) The standards include limits on particulate matter emission rate, sulfur dioxide emission rate and opacity of visible emissions. The standards have not been included in the proposed permit because they are less stringent than the permit limits representing BACT on the affected equipment.

A.A.C. R18-2-726 establishes an emission standard for sandblasting operations. This emission standard has been incorporated into the proposed permit.

A.A.C. R18-2-730 establishes emission standards for existing stationary sources not otherwise subject to emission standards under Article 7. These standards are incorporated into the proposed permit.

6. Emissions from Mobile Sources (New and Existing)

Article 8 of A.A.C. R18-2 establishes emission standards for mobile sources other than motor vehicles and agricultural equipment. These include the following:

A.A.C. R18-2-802 limits opacity of visible emissions from off-road machinery to 40 percent. This provision is incorporated into the proposed permit.

A.A.C. R18-2-804 limits opacity of visible emissions from roadway and site-cleaning machinery to 40 percent and requires reasonable precautions against airborne particulate matter from site or roadway cleaning operations. These provisions are incorporated into the proposed permit.

7. Arizona Ambient Air Quality Guidelines

Under the Air Toxics Control Policy (Permits Policy #0000.0006), ADEQ requires that new and modified sources undergo a review of air toxics emissions to determine whether controls are needed to limit the risks associated with those emissions. The Arizona Ambient Air Quality Guidelines (AAAQG's) are ambient concentration thresholds established for numerous toxic air contaminants. The applicant performed a review of air toxics emissions to demonstrate that the AAAQG's would not be exceeded for 30 air toxics believed to be emitted from the facility. Section VII.A.2 of this document describes this air toxics review, including a detailed discussion of emission rates and dispersion modeling techniques.

V. MONITORING AND COMPLIANCE DEMONSTRATION PROCEDURES

A. Compliance Assurance Monitoring

Pursuant to A.A.C. R18-2-306.A.3.a and 40 CFR part 64, compliance assurance monitoring (CAM) plans are required for particulate matter and carbon monoxide emissions from the melt shop at the subject facility. This applicability is based on the melt shop meeting the following three applicability criteria:

- The melt shop is subject to emission limitations for particulate matter and carbon monoxide;
- The melt shop uses control devices to achieve compliance with its particulate matter and carbon monoxide emission limitations; and
- The melt shop has potential pre-control device emissions of particulate matter and carbon monoxide which exceed the applicable major source threshold of 100 tons per year.

The particulate matter CAM plan for the melt shop baghouse relies upon the

NSPS-required monitoring of opacity and DEC system performance, as described above, and additionally on the use of a bag leak detection system. The carbon monoxide CAM plan for the melt shop relies upon the use of a continuous emission rate monitoring system (CERMS) meeting the requirements of 40 CFR part 60, appendix B, Performance Specification 4, *Specifications and test procedures for carbon monoxide continuous emission monitoring systems in stationary sources*. These CAM plan provisions are incorporated into the Class I permit.

B. Periodic Monitoring

Pursuant to A.A.C. R18-2-306.A.3.b, the Class I permit for the subject facility must include periodic monitoring for all emission limitations and standards. This monitoring must be sufficient to yield reliable data from the relevant time period that are representative of compliance with the applicable emission limitation or standard. It may include instrumental or non-instrumental monitoring, periodic emission testing, or recordkeeping designed to serve as monitoring. All periodic monitoring terms must assure the use of terms, test methods, units, averaging periods, and other statistical conventions consistent with the applicable emission limitation or standard.

The permit contains monitoring, recordkeeping and reporting requirements, at least as stringent as those imposed by applicable regulations (e.g., NSPS subpart AAa) and meeting the requirements of A.A.C. R18-2-306.A.3.b.

VI. BEST AVAILABLE CONTROL TECHNOLOGY

As noted in Section IV.A herein, PSD regulations under Title I of the Federal Clean Air Act and A.A.C. R18-2-406.A , and the BACT requirements under those regulations, are applicable to the North Star Steel mini-mill for PM, PM_{10}, NO_X, CO, VOC and lead.

The term “best available control technology” is defined as follows:

“an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

The U.S. EPA's definitive guidance for performing a top-down BACT analysis is set forth in Chapter B of the October 1990 New Source Review Workshop Manual.[1] This guidance dictates that BACT analyses and determinations be performed on a source-by-source and pollutant-by-pollutant basis using the following five key steps:

- <u>Identify all control technologies.</u> For BACT purposes, "available" control options are those technologies or techniques with a practical potential for application to the subject emission units and pollutants. These may include fuel cleaning or treatment, inherently lower-polluting processes, and end-of-pipe control devices. All identified options are listed in this step; those that are identified as being technically infeasible or as having unacceptable energy, economic or environmental impacts are eliminated in subsequent steps.

- <u>Eliminate technically infeasible options.</u> In this step, the technical feasibility of each identified control option is evaluated with respect to source-specific factors. Technically feasible control options are those options that a) have been installed and operated successfully on the type of source under review or b) are both commercially available and applicable to the particular source under review.

- <u>Rank remaining control technologies by control effectiveness.</u> All remaining control alternatives not eliminated in step 2 are ranked and listed in order of overall control effectiveness for the pollutant under review. For each option, estimated control efficiency and overall emissions reduction must be documented.
- <u>Evaluate most effective controls and document results.</u> Beneficial and adverse energy, environmental and economic impacts of each remaining control option are listed and considered. If the best option (i.e., the option with the highest control effectiveness as ranked in step 3) is rejected as BACT due to unacceptable energy, environmental or economic impacts, the rationale must be documented for the public record and the next-best control option subjected to the same evaluation.

[1] *New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting*, draft, October 1990 (final document never published). U.S. EPA, Office of Air Quality Planning and Standards.

- Select BACT. Finally, the most effective control technology not eliminated in the previous step is proposed as BACT.

The NSR Workshop Manual also notes that, to complete the BACT process, an enforceable emission limit representing BACT must be included in the PSD permit. This emission limit must be met on a continual basis at all levels of operation, must demonstrate protection of short term ambient standards, and must be enforceable as a practical matter. In order for the emission limit to be enforceable as a practical matter, the permit must specify a reasonable compliance averaging time, consistent with established reference methods, and must include compliance verification procedures (i.e., monitoring requirements) designed to show compliance or non-compliance on a time period consistent with the applicable emission limit.

Materials considered by the applicant and by the Department in identifying and evaluating available control options include the following:

- Entries in the RACT/BACT/ LAER Clearinghouse maintained by the U.S. EPA. This database is the most comprehensive and up-to-date listing of control technology determinations available.

- Information provided by pollution control equipment vendors.

- Information provided by industry representatives and by other State permitting authorities. This information is particularly valuable in clarifying or updating control technology information that has not yet been entered into the RACT/BACT/ LAER Clearinghouse.

- Information provided by operators of similar facilities in foreign countries. The EPA guidance for identifying available technologies for consideration in a top-down BACT analysis does not require the consideration of information from foreign installations. However, the Department felt that it was appropriate to do so in this case, because the applicant's proposed electric arc shaft furnace (EASF) is different from any other electric arc furnace installed in the U.S.

The BACT evaluations and proposed BACT determinations for each of the emission units at the North Star Steel mini-mill are discussed in the following paragraphs:

A. Melt Shop

The emission units in the melt shop include the EASF, the ladle metallurgical facility (LMF) and the melt shop ventilation system. The emitting activities covered by the ventilation system include a natural gas-fired tundish dryer, two natural gas-fired tundish preheaters, two natural gas-fired ladle dryers, two natural gas-fired ladle preheaters, slag handling, and the exhaust from the continuous casting machine. For each pollutant, the applicant and the Department considered all available control technologies, and considered application of these technologies both for application to the EASF exhaust stream and for application to a combined melt shop exhaust stream.

1. Particulate Matter

The EASF exhaust is combined with the exhaust from the LMF and the melt shop ventilation system, and the particulate matter emissions in this combined exhaust stream are controlled using a positive-pressure baghouse achieving a filterable particulate matter outlet concentration of 0.0018 grains per dry standard cubic foot (gr/dscf).

Other available particulate matter control technologies include electrostatic precipitators, wet scrubbers, and mechanical collectors. None of these other technologies can achieve higher levels of control than the proposed baghouse. As shown in Table VI-A-1, no steel mini-mills listed in the Clearinghouse use any control technology other than a baghouse to control particulate matter emissions. The filterable particulate matter emission limitation of 0.0018 gr/dscf proposed by the applicant is lower than the emission limitations for the best-controlled steel mini-mills currently included in the Clearinghouse.

In addition, as part of the permit application review process, the Department contacted ASW Sheerness Steel, Ltd., of Sheerness, Kent, United Kingdom. The ASW facility includes a single-shaft Fuchs EASF with a nominal capacity of 108 tons per hour. This EASF is more similar to the applicant's proposed EASF than any in the U.S., and is believed to be the most similar of any in Europe. The Department's contact revealed that the level of particulate matter control achieved by this facility is less stringent than that proposed as BACT, and is expressed only as an opacity limitation equivalent to five percent.

In addition to the proposed configuration, with a baghouse serving the combined melt shop exhaust, the applicant also evaluated using three separate baghouses to control particulate matter emissions from the melt shop (i.e., one baghouse for the EASF exhaust, one baghouse for the LMF exhaust, and one baghouse for the melt shop ventilation system exhaust). As the EASF exhaust stream has a much higher particulate matter concentration than the other melt shop exhaust streams (approximately 11 gr/dscf, versus approximately 0.3 gr/dscf for the LMF exhaust and 0.09 gr/dscf for the melt shop ventilation system exhaust), this alternative configuration would result in much more cost-effective control of the EASF exhaust stream. However, separately controlling the particulate matter emissions from the melt shop ventilation system exhaust would be economically unreasonable. The annualized cost of installing and operating three separate baghouses exceeds the cost of installing and operating one larger baghouse by more than $4 million per year, with no corresponding environmental benefit. (Even if the melt shop ventilation system exhaust were controlled to the same level as the proposed melt shop baghouse (0.0018 gr/dscf), this alternative configuration would not achieve any PM emission reduction relative to the proposed configuration.) If the EASF exhaust and the LMF exhaust streams were controlled separately, the annualized cost of installing and operating a melt shop ventilation system baghouse would be approximately $15 million and would achieve PM emission reduction of approximately 60 tons per year. The average cost effectiveness of this control technology would be approximately $250,000 per ton of particulate matter removed. Due to the adverse environmental impact associated with exhausting the melt shop baghouse without PM controls (primarily due to excessive consumption of the remaining PSD PM10 increment), the Department concludes that any exhaust configuration that would involve uncontrolled melt shop ventilation system exhaust is unacceptable. In summary, the alternative exhaust configuration is rejected for two reasons: separately controlling PM emissions from the melt shop ventilation system is economically unreasonable, and exhausting PM emissions from the melt shop ventilation system without control would result in unacceptable environmental impacts.

The applicant also noted that the volumetric flow rate through its proposed melt shop baghouse [1.2 million actual cubic feet per minute (acfm)] is higher, per unit steel production, than other similar facilities. This may result in the applicant's emission rate, in terms of mass emissions per unit steel production, being higher than other facilities employing similarly efficient baghouses. The applicant justified its proposed melt shop exhaust flow rate on the following bases:

- The applicant's facility does not use roof monitors, which increase ventilation but decrease overall pollutant capture efficiency.

- The ventilation requirements of the EASF proposed by the applicant are greater than those of the conventional electric arc furnaces employed by other facilities.

- The relatively high ambient temperatures in Arizona require higher ventilation rates to ensure acceptable working conditions.

The Department concludes that the exhaust configuration and control device proposed by the applicant, utilizing a fabric filter baghouse to limit opacity of visible emissions to 3 percent and to control filterable particulate matter emissions from the combined melt shop exhaust stream to an outlet concentration of 0.0018 gr/dscf, represents BACT. The opacity limit is expressed as a six-minute average. The filterable particulate matter emission limit is expressed as a 24-hour average.

The BACT determination for total PM-10, which includes the condensible (back-half) fraction as well as the filterable fraction, is an emission limit of 0.0052 gr/dscf, using the same control technology described above. No control option that is more effective than the proposed fabric filter baghouse has been identified, and no more stringent limit has been achieved in practice.

The compliance demonstration procedures associated with these limits include initial and annual performance testing both for filterable PM and for total PM-10, operational monitoring as required by NSPS subpart AAa, and use of a fabric filter bag leak detection system. In addition, the melt shop baghouse particulate matter emission limits and opacity limits are subject to Compliance Assurance Monitoring requirements, as detailed in Section V herein.

The applicant has indicated that there are no quantifiable emissions from the melt shop other than those emissions exhausted through the melt shop baghouse. Therefore, in addition to the melt shop baghouse particulate matter emission limit, BACT for the melt shop ventilation system is represented by a zero opacity limit for the melt shop baghouse dust handling system and a six percent opacity limit for fugitive emissions from the melt shop. Both of these opacity limits are expressed as six-minute averages. Compliance demonstration requirements associated with these limits include initial and periodic performance testing, as well as operational monitoring as required by NSPS subpart AAa.

Table VI-A-1. Clearinghouse Entries for PM/PM_{10} from Steel Mini-Mill Electric Arc Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		POLLUTANT	EMISSION RATE		CONTROL DESCRIPTION
AL-0087	TRICO STEEL CO., LLC	ELECTRIC ARC FURNACE (EAF) - CARBON STEEL	440	TPH	PM	0.0032	GR/DSCF	NEGATIVE PRESSURE BAGHOUSE WITH STACK
IN-0061	STEEL DYNAMICS, INC.	ELECTRIC ARC FURNACE #1	225	TPH	PM	0.0032	GR/DSCF	BAGHOUSE, COMMON WITH LMS (S01)
IN-0073	QUALITECH STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	135	TPH	PM	0.0032	GR/DSCF	DIRECT SHELL EVAC, BAGHOUSE. THE FURNACE IS IN ENCLOSED BUILDING. MATERIAL DELIVERED THROUGH HOLE IN FLOOR. BAGHOUSE COLLECTOR FOR FURNACE AND ROOM.
IA-0031	IPSCO STEEL INC	ELECTRIC ARC FURNACE/STEEL FOUNDRY	230	TPH	PM/PM10	0.0033	GR/DSCF	BAGHOUSE-POLYBAGS 32 MODULES/260 BAGS PER MODULE
AL-0077	TUSCALOOSA STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	160	TPH	PM	0.0035	GR/DSCF	NEGATIVE PRESSURE BAGHOUSE WITH STACK (WHEELABRATOR MODEL 420)
SC-0039	NUCOR STEEL	ELECTRIC ARC FURNACE	165	TONS	PM	0.0035	GR/DSCF	NEGATIVE PRESSURE BAGHOUSE
WA-0029	SALMON BAY STEEL CORPORATION	CASTER & FURNACES (2)	7200 00	CFM	PM	0.01	GR/DSCF	REVERSE AIR BAGHOUSE
WI-0075	CHARTER STEEL	STEEL PRODUCTION	40.83	TPH	PM	0.0052	GR/DSCF	BAGHOUSE
IN-0040	BETA STEEL	ELECTRIC ARC FURNACE (EAF), 2	100	TONS	PM/PM10	0.0052	GR/DSCF	BAGHOUSE (1.8 MM ACFM)
AL-0077	TUSCALOOSA STEEL CORP.	DIRECT REDUCED IRON (DRI) SHAFT FURNACE	68	TPH	PM	1.4	LB/HR	VENTURI SCRUBBER
AR-0017	STAFFORD RAILSTEEL CORPORATION	CASTER, EAF/LMF CONTINUOUS	125	TPH	PM	32.5	TPY	BAGHOUSE, DIRECT EVACUATION CANOPY/SIDE DRAFT & CANOPY HOOD
IN-0045	BETA STEEL	MELTSHOPS, EAF (2)	1.1	MM TPY	PM/PM10	257	TPY	DIRECT SHELL EVACUATION (DSE) AND SCRUBBER
IN-0045	BETA STEEL	MELTSHOPS, EAF (2)	1.1	MM TPY	PM/PM10	257	TPY	DIRECT SHELL EVACUATION (DSE) AND SCRUBBER
VA-0226	ROANOKE ELECTRIC STEEL CORP.	NO. 5 ELECTRIC ARC FURNACE	5000 00	TPY	PM10	23.7	TPY	BAGHOUSE
VA-0226	ROANOKE ELECTRIC STEEL CORP.	NO. 5 ELECTRIC ARC FURNACE	5000 00	TPY	TSP	31.2	TPY	BAGHOUSE

2. Carbon Monoxide

Carbon monoxide emissions from the EASF will be controlled using a direct-shell evacuation control (DEC) system and an enhanced secondary post-combustion (ESPCC) system. This control option will result in an overall CO emission rate from the melt shop (including the contribution from the LMF and the combustion sources) of 6.0 pounds per ton of steel produced. At the proposed maximum production capacity of 120 tons of steel per hour, this will result in a maximum melt shop exhaust CO emission rate of 725 pounds per hour. The DEC system is a process control option that maximizes CO destruction by regulating the amount of air introduced into the ductwork. The ESPCC system utilizes a natural gas-fired, air-fuel burner in a vertical, refractory-lined chamber to oxidize CO in the furnace exhaust. As shown in Table VI-A-2, all steel mini-mills listed in the Clearinghouse use one or both of these two control techniques for CO control.

In addition to the proposed control option, the applicant and the Department evaluated catalytic oxidation, direct-flame thermal oxidation, recuperative thermal oxidation, and regenerative thermal oxidation for CO control. These controls were considered both for application to the combined melt shop configuration, as proposed, and for application to the EASF exhaust separately. The methodology used for this evaluation is as follows:

- Any of these control options would represent BACT only if both of the following were true: a) the control option is technically feasible and b) the control option would not result in any unacceptable adverse energy, environmental, or economic impacts.

- None of the listed control options has been installed and operated successfully on a EAF exhaust or a steel mini-mill melt shop exhaust. Thus, any of these control options would be technically feasible only if both of the following were true: a) the control option is commercially available and b) the control option is applicable to the melt shop exhaust.

- Each of the listed control options is commercially available.

- A control option is considered "applicable" if it can reasonably be installed and operated on the EASF exhaust or the melt shop exhaust. The determination of reasonableness in this analysis is based on the technical judgment of the Department. In making this determination, the Department considers the physical and chemical characteristics of the exhaust gas stream, as well as whether there are unresolvable technical difficulties that would preclude successful deployment of the control technique.

The results of the Department's evaluation of the listed CO control options are as follows:

- Any CO control option that would require application of a dedicated PM control device (e.g., baghouse) for the EASF exhaust, separate from the melt shop exhaust, is considered by the Department to be technically infeasible. This conclusion is based on the fact that the PM BACT determination, discussed in Section VI.A.1, requires control of the combined EASF exhaust, LMF exhaust, and melt shop ventilation system exhaust streams. Other PM control configurations were eliminated based on adverse environmental and economic impacts. The Department considers a CO control option that is in conflict with the PM BACT determination to be technically infeasible, thereby rendering such CO control option not applicable.

- Control of CO in the EASF or melt shop exhaust using catalytic oxidation upstream of the baghouse is technically infeasible due to catalyst masking and fouling by contaminants in the exhaust stream, based on catalyst vendor responses to a request for quotation.

- Control of CO in the EASF or melt shop exhaust using catalytic oxidation downstream of the baghouse is technically infeasible due to catalyst masking and fouling by contaminants in the exhaust stream, based on catalyst vendor responses to a request for quotation. (The Department notes that, even if a catalyst formulation were developed to eliminate these masking and fouling problems, control of CO in the EASF exhaust using catalytic oxidation downstream of a dedicated baghouse is considered technically infeasible as described above. Control of CO in the combined melt shop exhaust using catalytic oxidation downstream of a dedicated baghouse would be rejected due to adverse environmental and economic impacts because of the large amount of fuel combustion needed to reheat the exhaust gas.)

- Direct-fired or regenerative or recuperative thermal oxidation for CO control in the combined melt shop exhaust would result in unacceptable environmental and economic impacts because of the large amount of fuel combustion needed to heat the exhaust gas to 1400°F.

- Regenerative thermal oxidation for CO control in the EASF exhaust is eliminated based on unacceptable economic impacts. The average cost effectiveness of this control option is more than $1,200 per ton of CO emission reduction and the incremental cost effectiveness is more than $3,000 per ton of CO emission reduction. The Department is unaware of any facility in the steel industry (i.e., either integrated mill or mini-mill) that has been required to implement a CO control technique at any comparable cost.

- The NSR Workshop Manual states that, "absent a concern over an overriding environmental impact or other considerations, an acceptable

> demonstration of an adverse economic impact can be an adequate basis for eliminating the control alternative." In accordance with this guidance, the Department concludes that a CO control technique with an average cost effectiveness of more than $1,200 per ton and an incremental cost effectiveness of $3,200 per ton, and having no overriding environmental impact or other considerations, should be eliminated from consideration as BACT for this facility based on its adverse economic impact.

The applicant also noted that other steel mini-mill facilities using conventional electric arc furnaces achieve substantially lower CO emissions, in terms of mass emissions per ton of steel produced, than that proposed for the EASF. The applicant demonstrated that the higher emissions for the EASF are due to inherent process differences, as the furnace exhaust gases are used to pre-heat the scrap charge. The applicant also demonstrated that a similarly-sized, conventional EAF cannot be used at the Kingman site, due to insufficient capacity in the local power grid. Therefore, the Department considers the use of a conventional EAF to be technically infeasible.

The applicant also noted that the use of the EASF results in reduced electrical consumption relative to a conventional EAF. The applicant did not quantify the environmental benefits of reduced electrical consumption, but the Department developed a rough estimate of the air pollutant emissions that will be avoided as a result of installing an EASF rather than a conventional EAF. The manufacturer of the applicant's EASF, Fuchs Systems, claims reduced electrical consumption of up to 120 kilowatt-hours per ton of steel produced. Assuming a production level of 800,000 tons of steel per year, the avoided electrical consumption relative to a conventional EAF averages approximately 10 megawatts. Assuming that the avoided electrical consumption equates to avoided generation by a state-of-the-art combined-cycle electric generating station, the avoided emissions are approximately 2 tons PM_{10}, 3 tons NO_X, 7 tons CO and 1 ton VOC per year.

As noted previously, the Department contacted ASW Sheerness Steel, Ltd., of the United Kingdom, during the permit application review process. The ASW facility includes a single-shaft Fuchs EASF similar to that proposed by the applicant. The Department's contact revealed that the level of carbon monoxide control achieved by this facility is equivalent to 12.8 pounds per ton of steel produced, which is less stringent than the emission limit proposed by the applicant as BACT. This information was considered by the Department in concluding that the level of CO control achieved by conventional electric arc furnaces in the U.S. is not representative of the level that can be achieved by an electric arc shaft furnace.

Table VI-A-2. Clearinghouse Entries for CO from Steel Mini-Mill Electric Arc Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		EMISSION RATE		CONTROL DESCRIPTION
IA-0031	IPSCO STEEL INC	ELECTRIC ARC FURNACE/STEEL FOUNDRY	230	TPH	210	LBS/HR	SLOT AND POST COMBUSTION CHAMBER DEC\ELBOW SLOT\POST COMBUSTION\WATER COOLED DUCT
VA-0226	ROANOKE ELECTRIC STEEL CORPORATION	NO. 5 ELECTRIC ARC FURNACE	500000	TPY	342	TPY	DEC SYSTEM
VA-0226	ROANOKE ELECTRIC STEEL CORPORATION	LADLE FURNACE	500000	TPY	120	TPY	
AR-0017	STAFFORD RAILSTEEL CORPORATION	CASTER, EAF/LMF CONTINUOUS	125	TPH	1166.4	TPY	DEC/AIR GAP/WATER COOLED DUCT
AL-0077	TUSCALOOSA STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	160	TPH	320	LB/HR	DIRECT EVACUATION CANOPY (DEC)
AL-0077	TUSCALOOSA STEEL CORP.	LADLE METALLURGY STATION	160	TPH	32	LB/HR	
AL-0087	TRICO STEEL CO., LLC	ELECTRIC ARC FURNACE (EAF) - CARBON STEEL	440	TPH	2	LB/TON	DIRECT EVACUATION CANOPY (DEC)
AL-0087	TRICO STEEL CO., LLC	LADLE METALLURGICAL FURNACES	440	TPH	0.3	LB/TON	
IN-0054	NUCOR STEEL	FURNACE, ELECTRIC ARC			2	LB/TON STEEL	DIRECT SHELL EVACUATION (DSE) W/ ENLARGED DUCT
IN-0061	STEEL DYNAMICS, INC.	ELECTRIC ARC FURNACE #1	225	TPH	2	LB/TON	DIRECT SHELL EVACUATION (DSE)
IN-0073	QUALITECH STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	135	TPH	4.7	LBS/TON	POST COMBUSTION UNDER HOOD BY OXYGEN INJECTION AND OXYFUEL BURNERS & FOURTH HOLE WITH ADJUSTABLE GAP TO ALLOW AIR INTO WATER COOLED DUCTWORK FOR COMBUS
IN-0055	KOBELCO METAL POWDER OF AMERICA, INC.	FURNACE, ELECTRIC ARC			10.5	LB/TON 24 AVG PERIOD	DOGHOUSE ENCLOSURE EVACUATED TO BAGHOUSE
SC-0039	NUCOR STEEL	ELECTRIC ARC FURNACE	165	TONS	2	LB/TON STEEL PRODUCE	FOAMING SLAG PROCESS AND DIRECT SHELL EVACUATION CONTROLS
WI-0075	CHARTER STEEL	STEEL PRODUCTION	40.83	TPH	3.83	LB/TON STEEL TAPPED	DEC, OPERATING PRACTICES
IN-0045	BETA STEEL	MELTSHOPS, EAF (2)	1.1	MM TPY	3578.8	TPY	DSE, THERMAL DESTRUCTION IN ELBOW
IN-0040	BETA STEEL	ELECTRIC ARC FURNACE (EAF), 2	100	TONS	817	LB/HR	DIRECT SHELL EVACUATION SYSTEM (140,000 ACFM), 200% THEORETICAL COMBUSTION AIR

The other United States steel mini-mills with EASF's include Chaparral Steel in Virginia, North Star BHP Steel (NSBHP) in Ohio, and Birmingham Steel in Tennessee. Birmingham Steel shut down due to economic conditions before ever conducting performance tests, so it is not useful in determining achievable emission rates. Available performance test data for Chaparral Steel indicate CO emissions of 7.85 lb/ton (24-hour average basis), which is higher than the proposed 6.0 lb/ton for NSSA. NSBHP was issued a revised PSD permit by Ohio Environmental Protection Agency (OEPA) in November 2000 in order to incorporate a less stringent CO emission limit of approximately 8.8 lb/ton (as compared to 2.0 lb/ton in the initial permit; calculated as the sum of the separate limits for various melt shop emission units). Note that this permit was issued by OEPA pursuant to its delegated authority to implement 40 CFR 52.21. Neither of these facilities uses an add-on control device for CO emissions. The Virginia Department of Environmental Quality rejected thermal oxidation based on economic infeasibility and catalytic oxidation based on technical infeasibility. OEPA rejected both technologies based on technical infeasibility.

The Department concludes that the exhaust configuration and control device proposed by the applicant, utilizing a direct shell evacuation control system and a secondary post-combustion system on the EASF, represents BACT. This control option will result in an overall CO emission rate from the melt shop (including the small contribution from the LMF and the small combustion sources) of 6.0 pounds per ton of steel produced. This control level is expressed as a maximum allowable emission rate limit, based on the maximum demonstrated steel production rate during a performance test, expressed as a 24-hour average. The compliance demonstration procedures for this emission limit include initial and annual performance tests and use of a CERMS.

In addition, the permit contains a condition which requires the Permittee to perform an optimization study on the ESPCC to determine if a lower CO emission rate is attainable. The study will look at the effect each of the following items has on the CO emission rate:

- Size of the EASF heat;
- EASF cycling times (including melting and refining times);
- Firing rates of the in-furnace oxy-fuel burners;
- Carbon balance for each phase of the melting cycle;
- Firing rate of the ESPCC;
- Operational status of the emission units venting through the melt shop canopy; and
- NO_x emission rates during each phase of the melting cycle.

The study may also include a statistical analysis of the variability in the CO emission rate. After completing the optimization study (within 180 days of the start-up of the ESPCC), the Permittee is required to submit a report to the Department which includes the results of the optimization study. The

Department will use the information from this study, continuous emission monitoring system data, and any additional relevant information or studies to establish a final emission limit for CO in terms of pounds per ton of steel produced (not to exceed 6.0 pounds per ton).

3. Nitrogen Oxides

Nitrogen oxide emissions from the EASF and LMF are believed to result primarily from the oxidation, by electrical current, of molecular nitrogen in the air that is allowed to infiltrate the furnaces. (This infiltration is distinct from the intentional drawing of air into the secondary post-combustion system, in the ductwork downstream of the EASF, which is used to minimize CO and VOC emissions.) To a lesser extent, the burners in the EASF may also contribute some NO_X emissions. Therefore, NO_X emissions from the melt shop exhaust will be minimized by:

- Use of natural gas-fired oxy-fuel burners in the EASF (which minimizes nitrogen levels in the furnace by supplying oxygen instead of air),
- Use of natural gas-fired air-fuel burners in the enhanced secondary post-combustion chamber (which minimizes NOx formation by limiting the flame temperatures); and
- Adherence to good operating practices, including the minimization of air infiltration into the EASF and LMF.

Minimizing air infiltration into the EASF is accomplished by designing as tight a furnace shell as is practical and managing the door openings (e.g., slag, oxygen lance, coke injection). The EASF is a direct-current furnace with only one electrode, unlike typical EAF's with alternating current and three electrodes, so there is only one hole in the furnace roof. Scrap is added to the furnace through the shaft, thereby reducing the furnace open time compared to a conventional EAF, which requires swinging the roof open to charge scrap. A certain amount of air has to enter the furnace to assist in the DEC system operation.

This control option will result in an overall NO_X emission rate from the melt shop (including the contribution from the LMF and the combustion sources) of 1.05 pounds per ton of steel produced. At the proposed maximum production capacity of 120 tons of steel per hour, this will result in a maximum melt shop exhaust NO_X emission rate of 126 pounds per hour.

In addition to the proposed control option, the applicant and the Department evaluated other process controls and end-of-pipe controls for the EASF exhaust. The applicant demonstrated that combustion controls such as low-NO_X burners, staged combustion and flue gas recirculation are technically infeasible due to the NO_X formation mechanism in the EASF. The applicant also demonstrated that selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR) are technically infeasible. SCR cannot be applied to the melt shop exhaust due to the extreme variability in exhaust stream temperature, flow rate and NO_X concentration and due to the potential for catalyst fouling from particulate and trace metals in the exhaust stream. Similarly, SNCR cannot be applied to the melt shop exhaust due to the extreme variability in exhaust stream temperature, flow rate and NO_X concentration. As shown in Table VI-A-3, no steel mini-mills listed in the Clearinghouse utilize any end-of-pipe NO_X control technology.

The applicant also noted that other steel mini-mill facilities using conventional electric arc furnaces achieve substantially lower NO_X emissions, in terms of mass emissions per ton of steel produced, than that proposed for the EASF. The applicant demonstrated that the higher emissions for the EASF are due to inherent process differences, as the EASF derives much more heat from oxy-fuel burners and much less heat from the electrode, reducing electrical consumption relative to a conventional EAF.

The applicant also demonstrated that a similarly-sized, conventional EAF cannot be used at the Kingman site, due to insufficient capacity in the local power grid, and therefore a conventional EAF is not a feasible control alternative for consideration in the NO_X BACT analysis.

As noted previously, the Department contacted ASW Sheerness Steel, Ltd., of the United Kingdom, during the permit application review process. The ASW facility includes a single-shaft Fuchs EASF similar to that proposed by the applicant. The Department's contact revealed that this facility is not subject to any limitation on NOx emissions.

The Department concludes that the control option proposed by the applicant, utilizing natural gas-fired oxy-fuel burners in the EASF and the adherence to good operating practices, including the minimization of air infiltration into the EASF, represents BACT. This control option will result in an overall NO_X emission rate from the melt shop (including the contribution from the LMF and the small combustion sources) of 1.05 pounds per ton of steel produced. This control level is expressed as a maximum allowable emission rate limit, based on the maximum steel production rate demonstrated during a performance test, and expressed as a 24-hour average. The compliance demonstration procedures for this emission limit include initial and annual performance tests and use of a CERMS.

Table VI-A-3. Clearinghouse Entries for NO_x from Steel Mini-Mill Electric Arc Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		EMISSION RATE		CONTROL DESCRIPTION
IN-0045	BETA STEEL	MELTSHOPS, EAF (2)	1.1	MM TPY	97.4	TPY	SCR - LOW NOX BURNERS
IN-0040	BETA STEEL	ELECTRIC ARC FURNACE (EAF), 2	100	TONS	22.2	LB/HR	NOT REQUIRED UNDER BACT. EMISSIONS RELATIVELY INSIGNIFICANT
VA-0226	ROANOKE ELECTRIC STEEL CORPORATION	NO. 5 ELECTRIC ARC FURNACE	500000	TPY	30	TPY	
VA-0226	ROANOKE ELECTRIC STEEL CORPORATION	LADLE FURNACE	500000	TPY	15	TPY	
IA-0031	IPSCO STEEL INC	ELECTRIC ARC FURNACE/STEEL FOUNDRY	230	TPH	63	LBS/HR	OXYFUEL/LOW NOX BURNER SCRAP PREHEATING BURNERS ONLY CONSIDERED BASELINE
SC-0039	NUCOR STEEL	ELECTRIC ARC FURNACE	165	TONS	0.35	LB/TON STEEL PRODUCE	LOW NOX BURNERS IN ELECTRIC ARC FURNACE SHELLS
AL-0077	TUSCALOOSA STEEL CORP.	DIRECT REDUCED IRON (DRI) SHAFT FURNACE	68	TPH	38.8	LB/HR	
AL-0077	TUSCALOOSA STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	160	TPH	0.35	LB/TON	
AL-0087	TRICO STEEL CO., LLC	ELECTRIC ARC FURNACE (EAF) - CARBON STEEL	440	TPH	0.35	LB/TON	DIRECT EVACUATION CANOPY (DEC)
AL-0087	TRICO STEEL CO., LLC	LADLE METALLURGICAL FURNACES	440	TPH	0.02	LB/TON	
AR-0017	STAFFORD RAILSTEEL CORPORATION	CASTER, EAF/LMF CONTINUOUS	125	TPH	261.2	TPY	DIRECT EVACUATION CANOPY (DEC)
IN-0054	NUCOR STEEL	FURNACE, ELECTRIC ARC			0.5	LB/TON STEEL	NONE FEASIBLE
IN-0073	QUALITECH STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	135	TPH	0.5	LBS/TON	
IN-0061	STEEL DYNAMICS, INC.	ELECTRIC ARC FURNACE #1	225	TPH	0.51	LB/TON	LOW NOX BURNERS
WI-0075	CHARTER STEEL	STEEL PRODUCTION	40.83	TPH	0.51	LB/TON STEEL TAPPED	OPERATING PRACTICES

4. Volatile Organic Compounds

Volatile organic compound (VOC) emissions from the EASF will be controlled through adherence to a scrap management program and the use of a direct shell evacuation control system and a secondary post-combustion system. This control option will result in an overall VOC emission rate from the melt shop (including the small contribution from the LMF and the small combution sources) of 0.35 pounds per ton of steel produced. At the proposed maximum production capacity of 120 tons of steel per hour, this will result in a maximum melt shop exhaust VOC emission rate of 42.3 pounds per hour. As shown in Table VI-A-4, all steel mini-mills listed in the Clearinghouse use one or more of the proposed options for VOC control.

As noted previously in the discussion of CO control options, the applicant and the Department evaluated catalytic oxidation and thermal oxidation, and determined that these add-on controls, regardless of exhaust configuration, are technically or economically infeasible. In addition, the applicant also evaluated the use of higher-quality scrap and hot-briquetted iron. These alternative raw materials contribute less VOC to the process gases, but at a substantially increased cost relative to the low-grade scrap proposed to be utilized. The use of hot-briquetted iron, for instance, would result in increased production costs of nearly $300,000 per ton of VOC emissions eliminated.

The applicant also noted that other steel mini-mill facilities using conventional electric arc furnaces and/or producing higher-quality steel products achieve substantially lower VOC emissions, in terms of mass emissions per ton of steel produced, than that proposed for the EASF. The applicant demonstrated that the higher emissions for the EASF are due to inherent process differences. Specifically:

- The EASF exhaust gases are used to pre-heat the scrap charge. Volatilization of oils in the scrap result in increased VOC concentration in the exhaust gas, but greatly reducing electrical consumption relative to a conventional EAF.

- Other facilities producing higher-quality steel products than the rod and reinforcing bar produced by North Star Steel use hot-briquetted iron and high-grade steel scrap as raw materials. These mills require the more iron-rich raw materials to meet product specifications; lower VOC emissions are incidental. The prices for North Star Steel Arizona’s products cannot support the use of these raw materials solely for environmental reasons.

Table VI-A-4. Clearinghouse Entries for VOC from Steel Mini-Mill Electric Arc Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		EMISSION RATE		CONTROL DESCRIPTION
AR-0017	STAFFORD RAILSTEEL CORPORATION	CASTER, EAF/LMF CONTINUOUS	125	TPH	45.6	TPY	SCRAP MANAGEMENT PROGRAM
IN-0040	BETA STEEL	ELECTRIC ARC FURNACE (EAF), 2	100	TONS	0.13	LB/TON STEEL PROD.	SCRAP MGMT, ELIMINATE STEEL W/ HIGH OIL CONTENT
IN-0045	BETA STEEL	MELTSHOPS, EAF (2)	1.1	MM TPY	73.5	TPY	SCRAP MANAGEMENT/CLEAN SCRAP
IN-0061	STEEL DYNAMICS, INC.	ELECTRIC ARC FURNACE #1	225	TPH	0.13	LB/TON	SCRAP MANAGEMENT
SC-0039	NUCOR STEEL	ELECTRIC ARC FURNACE	165	TONS	0.13	LB/TON STEEL PRODUCE	SCRAP MANAGEMENT PROGRAM
IN-0073	QUALITECH STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	135	TPH	0.15	LBS/TON STEEL PROD.	SCRAP MANAGEMENT - NO HEAVY OILED SCRAP
AL-0087	TRICO STEEL CO., LLC	ELECTRIC ARC FURNACE (EAF) - CARBON STEEL	440	TPH	0.2	LB/TON	SCRAP MANAGEMENT
AL-0077	TUSCALOOSA STEEL CORP.	ELECTRIC ARC FURNACE (EAF)	160	TPH	20.8	LB/HR	DIRECT EVACUATION CANOPY (DEC)
IA-0031	IPSCO STEEL INC	ELECTRIC ARC FURNACE/STEEL FOUNDRY	230	TPH	31	LBS/HR	DEC/ELBOW SLOT/POST COMBUSTION/WATER COOLED DUCT
VA-0226	ROANOKE ELECTRIC STEEL CORPORATION	NO. 5 ELECTRIC ARC FURNACE	500000	TPY	87.5	TPY	
VA-0226	ROANOKE ELECTRIC STEEL CORPORATION	LADLE FURNACE	500000	TPY	0.5	TPY	

As noted previously, the Department contacted ASW Sheerness Steel, Ltd., of the United Kingdom, during the permit application review process. The ASW facility includes a single-shaft Fuchs EASF similar to that proposed by the applicant. The Department's contact revealed that this facility is not subject to any limitation on VOC emissions.

The Department concludes that the exhaust configuration and control device proposed by the applicant, utilizing scrap management,a direct-shell evacuation control system and a secondary post-combustion system on the EASF, represents BACT. This control option will result in an overall VOC emission rate from the melt shop (including the small contribution from the LMF and the small combustion sources) of 0.35 pounds per ton of steel produced. This control level is expressed as a maximum allowable emission rate, based on a three-hour average. The compliance demonstration procedures for this emission limit include initial and annual performance tests.

5. Lead

Lead emissions from the EASF and from the combined melt shop exhaust will be controlled by maintaining strict controls on the raw materials fed to the EASF and by using a baghouse to control particulate matter emission from the melt shop. This control option will result in an overall lead emission rate from the melt shop (including the small contribution from the LMF and the small combustion sources) of 0.0025 pounds per ton of steel produced. At the proposed maximum production capacity of 120 tons of steel per hour, this will result in a maximum melt shop exhaust lead emission rate of 0.30 pounds per hour. No other available control options were identified. The proposed emission rate assumes an average lead concentration of 1.95 percent in particulate matter emitted from the melt shop baghouse.

The Department concludes that the control option proposed by the applicant, utilizing scrap management and a melt shop baghouse, represents BACT. The control level is expressed as a maximum allowable emission rate, based on a 24-hour average. The compliance demonstration procedures for this emission limit include initial and annual performance tests.

B. Natural Gas-Fired Reheat Furnace

The reheat furnace heats steel billets to the proper temperature for malleability for rolling into finished products. The reheat furnace can be either "hot-charged," with steel billets coming directly from the continuous casting machine, or "cold-charged," with billets having been stored since casting.

This furnace is a walking-beam type furnace with five heating zones and the capability to charge and discharge billets through its side by means of roller tables. It fires exclusively natural gas, using low-NO_X burners and flue gas recirculation, with a maximum heat input capacity of 74.0 million Btu per hour.

1. Particulate Matter

Particulate matter emissions from the reheat furnace will be minimized by the exclusive use of natural gas as fuel. The applicant has indicated that the sole PM formation mechanism in the reheat furnace is the combustion of fuel and that the steel reheating process is not a source of particulate matter emissions. Therefore, using the EPA's default emission factor of 0.00745 pounds per million Btu heat input from natural gas and the proposed maximum heat input rate of 74.0 million Btu per hour, the maximum reheat furnace PM emission rates will be 0.55 pounds per hour and 2.41 tons per year.

For this source, PM is conservatively assumed to be equivalent to PM_{10}, so a combined BACT analysis is appropriate.

The applicant and the Department reviewed recent permitting decisions for similar facilities (see Table VI-B-1) and confirmed that no other technically feasible control options have been identified. Three other facilities with more stringent *numerical* particulate matter emission limits than that proposed by the applicant were identified:

- The Birmingham Steel facility in Tennessee is subject to a reheat furnace particulate matter emission limit of 0.003 pounds per million Btu heat input. The control option selected as BACT was identical to that proposed by the applicant. The Birmingham Steel facility is not required to perform emissions testing for particulate matter from the reheat furnace.

- Qualitech Steel in Pittsboro, Indiana (entry IN-0073 in the Clearinghouse) is subject to a reheat furnace particulate matter emission limit of 0.003 pounds per million Btu heat input. The control option selected as BACT was identical to that proposed by the applicant. The Qualitech Steel facility is not required to perform emissions testing for PM from the reheat furnace.

Table VI-B-1. Other BACT Determinations for PM/PM_{10} from Steel Mill Reheat Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		POLLUTANT	EMISSION RATE		CONTROL DESCRIPTION
N/A	IPSCO STEEL INC.	REHEAT FURNACE	N/A	N/A	PM	0.006	LB/MMBTU	FUEL SPEC: USE OF SULFUR-FREE NATURAL GAS
N/A	BIRMINGHAM STEEL	REHEAT FURNACE	N/A	N/A	PM	0.003	LB/MMBTU	FUEL SPEC: USE OF NATURAL GAS
AL-0087	TRICO STEEL CO., LLC	TUNNEL FURNACE	440	TPH	PM	1.5	LB/HR	FUEL SPEC: NATURAL GAS
AR-0017	STAFFORD RAILSTEEL CORPORATION	FURNACE, REHEAT	146	MMBTU/HR	PM	10.7	TPY	FUEL SPEC: USE OF NATURAL GAS
IN-0040	BETA STEEL	REHEAT FURNACE, SLAB (2)	264.6	MM BTU/HR (EACH)	PM/PM10	5	LB/MM SCF GAS BURNED	BAGHOUSE
IN-0045	BETA STEEL	FURNACES, REHEAT (NATURAL GAS)	1.1	MM TPY	PM/PM10	4.65	TPY	SCR - LOW NOX BURNERS
IN-0045	BETA STEEL	FURNACES, REHEAT (NATURAL GAS)	1.1	MM TPY	PM/PM10	4.65	TPY	SCR - LOW NOX BURNERS
IN-0070	NUCOR STEEL	SNUB FURNACE ON NO.1 TUNNEL FURNACE	6	MMBTU/HR	PM/PM10		SEE P2	FUEL SPEC: NATURAL GAS
IN-0073	QUALITECH STEEL CORP.	REHEAT FURNACE	175	MMBTU/HR	PM/PM10	0.003	LB/MMBTU	FUEL SPEC: BURN NATURAL GAS ONLY

- The IPSCO Steel facility in Iowa is subject to a reheat furnace particulate matter emission limit of 0.006 pounds per million Btu heat input. The control option selected as BACT was identical to that proposed by the applicant, except that IPSCO is required to use natural gas with no sulfur content. The IPSCO Steel facility is not required to perform emissions testing for PM from the reheat furnace.

Of these three, only the IPSCO requirement that sulfur-free natural gas be combusted is likely more stringent than the applicant's proposed control option. Sulfur-free natural gas is not available in Arizona, so this control option is not technically feasible. The Birmingham Steel and Qualitech Steel emission limits, while numerically lower than that proposed for the North Star Steel facility, are based on the same control option and do not require any compliance testing. The Department does not believe that these limits are, as a practical matter, more stringent than that proposed for the North Star steel facility.

The Department concludes that using natural gas exclusively represents BACT for particulate matter emissions from the reheat furnace. This control level is expressed as maximum particulate matter emissions of 0.0075 pounds per million Btu heat input and 0.55 pounds per hour, both of which are based on a 24-hour average.

2. Carbon Monoxide

Carbon monoxide emissions from the reheat furnace will be minimized through adherence to good combustion practices and the exclusive use of natural gas as fuel to achieve an emission factor of 0.03 pounds per million Btu heat input. At the proposed maximum heat input rate of 74.0 million Btu per hour, this will result in a reheat furnace CO emission rate of 2.22 pounds per hour.

In addition to the proposed control option, the applicant identified catalytic oxidation, regenerative thermal oxidation and recuperative thermal oxidation as technically feasible control options. The applicant provided data showing that each of these control options would result in unreasonable economic impacts for the subject reheat furnace.

The applicant and the Department reviewed recent permitting decisions for similar facilities (see Table VI-B-2) and confirmed that no similar facility has been required to use a control technology substantially different than the proposed control option, or to achieve a more stringent emission limit than that proposed.

The Department concludes that adhering to good combustion practices and using natural gas exclusively represents BACT for CO emissions from the reheat furnace. This control level is expressed as maximum CO emissions of 0.030 pounds per million Btu heat input and 2.22 pounds per hour, both of which are based on a 24-hour average.

3. Nitrogen Oxides

Nitrogen oxide emissions from the reheat furnace will be minimized through the use of low-NO_X burners and flue gas recirculation, and the exclusive use of natural gas as fuel, to achieve an emission factor of 0.100 pounds per million Btu heat input. At the proposed maximum heat input rate of 74.0 million Btu per hour, this will result in a maximum reheat furnace NO_X emission rate of 7.40 pounds per hour.

In addition to the control option proposed as BACT, the applicant and the Department identified and evaluated SCR and SNCR as available control technologies. The applicant demonstrated that SNCR is technically infeasible for application to the reheat furnace because the unit employs direct heat transfer, whereas SNCR is designed for use with boilers and other units employing indirect heat transfer. For SNCR to be used in the reheat furnace, the necessary reagent could not be injected without contacting the steel being heated, and process considerations would prohibit the re-design of the furnace chamber to allow sufficient gas residence time for NO_X reduction reactions to occur.

As shown in Table VI-B-3, only one similar facility has been required to achieve a more stringent emission limit than that proposed herein. This facility, Beta Steel in Portage, Indiana (entry IN-0040 in the Clearinghouse), is required to use SCR to achieve 0.0147 pounds NO_X per million Btu heat input. The facility has not yet demonstrated compliance with this limit. The as-yet-unresolved performance issues at Beta Steel cause concern to both the applicant and the Department but, for the purpose of performing the BACT analysis for the applicant's reheat furnace, SCR was considered to be a technically feasible control option. Both the applicant and the Department recognize that, even if the performance issues can be resolved, the level of NO_X control that SCR can achieve on a reheat furnace is somewhat uncertain.

At the Department's request, the applicant obtained a quotation from Huntington Environmental Systems, Inc., the vendor that supplied the SCR system for the Beta Steel installation. Huntington was viewed as the best-qualified vendor to provide such a quote for a reheat furnace, as they have been working closely with Beta Steel and with the Indiana Department of Environmental Management to implement design and operational changes to effectively control NO_X emissions from the Beta Steel reheat furnace.

Table VI-B-2. Clearinghouse Entries for CO from Steel Mill Reheat Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		EMISSION RATE		CONTROL DESCRIPTION
AL-0087	TRICO STEEL CO., LLC	TUNNEL FURNACE	440	TPH	10.5	LB/HR	FUEL SPEC: NATURAL GAS
AR-0017	STAFFORD RAILSTEEL CORPORATION	FURNACE, REHEAT	146	MMBTU/HR	22.4	TPY	FUEL SPEC: USE OF NATURAL GAS
IN-0040	BETA STEEL	REHEAT FURNACE, SLAB (2)	264.6	MM BTU/HR (EACH)	40	LB/MM SCF GAS BURNED	BAGHOUSE

Table VI-B-3. Clearinghouse Entries for NO_x from Steel Mill Reheat Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		EMISSION RATE		CONTROL DESCRIPTION
IN-0062	STEEL DYNAMICS, INC.	TUNNEL FURNACE (NATURAL GAS)	117.9	MMBTU/HR	0.17	LB/MMBTU	LOW NOX BURNERS
IN-0070	NUCOR STEEL	SNUB FURNACE ON NO.1 TUNNEL FURNACE	6	MMBTU/HR	0.19	LB/MMBTU	LOW NOX BURNERS
IN-0073	QUALITECH STEEL CORP.	REHEAT FURNACE	175	MMBTU/HR	0.15	LBS/MMBTU	LOW NOX BURNERS
IN-0054	NUCOR STEEL	FURNACE, ROLLER HEARTH			20	LB/MMCFT	LOW NOX BURNERS, ADDING SECOND ROLLER HEARTH FURNACE
SC-0039	NUCOR STEEL	TUNNEL FURNACE	125	MMBTU	190	LB/MMCF NAT. GAS	LOW NOX BURNERS
IN-0040	BETA STEEL	REHEAT FURNACE, SLAB (2)	264.6	MM BTU/HR (EACH)	14.7	LB/MM SCF GAS BURNED	LOW NOX BURNER & SCR
IN-0045	BETA STEEL	FURNACES, REHEAT (NATURAL GAS)	1.1	MM TPY	13.7	TPY	SCR - LOW NOX BURNERS
AL-0087	TRICO STEEL CO., LLC	TUNNEL FURNACE	440	TPH	30	LB/HR	LOW NOX BURNERS
AR-0017	STAFFORD RAILSTEEL CORPORATION	FURNACE, REHEAT	146	MMBTU/HR	109.4	TPY	STAGED COMBUSTION, FUEL SPEC: USE OF NATURAL GAS, LOW NOX BURNERS

Price quotations were provided for SCR-based control systems designed to achieve overall NO_X emission factors of 0.01 pounds and 0.03 pounds per million Btu heat input. These two emission factors are for systems with relatively minor design differences, and are representative of the range of control efficiencies achievable with SCR systems. Both systems are designed to be used in conjunction with low-NO_X burners and flue gas recirculation. Based on the quotations received from Huntington, and including all ancillary equipment, the capital costs of the two systems are approximately $814,000 and $718,000, respectively. For both systems, the overall control cost-effectiveness is approximately $5,000 per ton of NO_X reduction, and $10,000 per ton of incremental NO_X reduction beyond that achievable with low-NO_X burners and flue gas recirculation as proposed. These values represent unreasonable economic impacts on the reheat furnace installation, even without taking into consideration the apparent performance issues.

Therefore, the Department concludes that low-NO_X burners and flue gas recirculation, and the exclusive use of natural gas as fuel, represents BACT for NO_X emissions from the reheat furnace. This control level is expressed as maximum NO_X emissions of 0.100 pounds per million Btu heat input and 7.40 pounds per hour, both of which are based on a 24-hour average.

4. Volatile Organic Compounds

Volatile organic compound (VOC) emissions from the reheat furnace will be minimized through adherence to good combustion practices and the exclusive use of natural gas as fuel to achieve an emission factor of 0.0014 pounds per million Btu heat input. At the proposed maximum heat input rate of 74.0 million Btu per hour, this is equivalent to a reheat furnace VOC emission rate of 0.10 lb/hr.

In addition to the control option proposed as BACT, the applicant identified catalytic oxidation, regenerative thermal oxidation, and recuperative thermal oxidation as technically feasible control options. The applicant provided data showing that each of these control options would result in unreasonable economic impacts for the subject reheat furnace.

The applicant and the department reviewed recent permitting decisions for similar facilities (see Table VI-B-4) and confirmed that no similar facility has been required to use a control technology substantially different than the proposed control option, or to achieve a more stringent emission limit than that proposed.

Table VI-B-4. Clearinghouse Entries for VOC from Steel Mill Reheat Furnace

RBLCID	FACILITY	PROCESS	THROUGHPUT		EMISSION RATE		CONTROL DESCRIPTION
AL-0087	TRICO STEEL CO., LLC	TUNNEL FURNACE	440	TPH	0.2	LB/HR	FUEL SPEC: NATURAL GAS
AR-0017	STAFFORD RAILSTEEL CORPORATION	FURNACE, REHEAT	146	MMBTU/HR	1.8	TPY	FUEL SPEC: USE OF NATURAL GAS
IN-0040	BETA STEEL	REHEAT FURNACE, SLAB (2)	264.6	MM BTU/HR (EACH)	1.7	LB/MM SCF GAS BURNED	BAGHOUSE

The Department concludes that adhering to good combustion practices and using natural gas exclusively represents BACT for VOC emissions from the reheat furnace. This control level is expressed as maximum VOC emissions of 0.0014 pounds per million Btu heat input and 0.10 pounds per hour, both of which are based on a 24-hour average.

C. Wet Cooling Towers

The applicant's facility includes two mechanical-draft wet cooling towers. These towers are heat exchangers that are used to dissipate large heat loads to the atmosphere. Particulate matter emissions from each of these cooling towers will be minimized through management of the solids content in the cooling water and through the use of high-efficiency drift eliminators. The direct cooling water cooling tower has two cells, a total design circulation rate of 14,000 gallons per minute, and drift eliminators designed for a total liquid drift rate not to exceed 0.0006 percent of circulating water flow. The indirect cooling water cooling tower has three cells, a total design circulation rate of 34,500 gallons per minute, and drift eliminators designed for a total liquid drift rate not to exceed 0.002 percent of circulating water flow . This will result in particulate matter and PM-10 emissions of 14.10 and 7.05 tons per year, respectively (total for the two cooling towers).

The particulate matter formation mechanism in wet cooling towers is due to droplets of cooling water that escape, or "drift,"from the tower. These water droplets contain some quantity of suspended and dissolved solids. As the water droplet evaporates, the dissolved and suspended solids become airborne particulate matter.

In addition to the control option proposed as BACT, the applicant and the Department identified and evaluated dry cooling towers as an available control option. These dry cooling towers achieve heat dissipation by circulating the cooling water inside tubes or fins, with no contact between the water and the outside air. Because there is no contact between the cooling water and the outside air, there is no drift and there are zero emissions. Dry cooling towers have been used by several power plants, including the Otay Mesa Generating Project in California, for cooling and condensing of steam. However, performance of dry cooling towers is limited by the ambient dry-bulb temperature. The design dry ambient dry-bulb temperature in Kingman is 100 ^{o}F, as compared to an ambient wet-bulb temperature of 69 ^{o}F. The design cooling water temperature for the applicant's facility is 95 ^{o}F, which could not be achieved using dry cooling towers. Therefore, this control option is technically infeasible.

The applicant and the Department reviewed recent permitting decisions for other facilities with wet cooling towers, and no control options other than high-efficiency drift eliminators were identified. However, drift eliminators of varying efficiencies were identified. The most stringent level of control achieved by high-efficiency drift eliminators is 0.0006 percent total liquid drift. This is the control level proposed for the direct cooling water cooling tower.

At the Department's request, the applicant also obtained a quotation for equipping the indirect cooling water cooling tower with drift eliminators designed to achieve 0.0006 percent and 0.001 percent total liquid drift. The incremental cost of each of these more stringent control levels, relative to the use of drift eliminators designed for 0.002 percent total liquid drift, is more than $6,400 per ton of particulate matter reduced. This is an unreasonable economic impact.

Thus, the Department concludes that management of the solids content in the cooling water and using cooling towers equipped with high-efficiency drift eliminators represents BACT for particulate matter emissions for the proposed facility. For the direct cooling water cooling tower, this control option will result in particulate matter emissions of 0.46 pounds per hour and 0.55 pounds per million gallons of cooling water. The permit includes these emission limitations, in addition to three operational limitations: use of drift eliminators with guaranteed design total drift rate not to exceed 0.0006 percent of total liquid flow, maximum circulating water flow rate not to exceed 14,000 gallons per minute, and maximum solids content of 11.0 grams per liter in the circulating water. For the indirect cooling water cooling tower, this control option will result in particulate matter emissions of 2.76 pounds per hour and 1.33 pounds per million gallons of cooling water. The permit includes these emission limitations, in addition to three operational limitations: use of drift eliminators with guaranteed design total drift rate not to exceed 0.002 percent of total liquid flow, maximum circulating water flow rate not to exceed 34,500 gallons per minute, and maximum solids content of 8.0 grams per liter in the circulating water.

Compliance demonstration requirements for each of the wet cooling towers include monitoring of the circulating water flow rate, daily measurement of the circulating water solids content, and maintaining records of the guaranteed design total liquid drift.

D. Fugitive Dust from Paved and Unpaved Roads

The applicant's facility includes paved and unpaved roadways upon which automobiles and trucks will travel. The applicant has proposed to implement all available dust control measures for these roadways, including the following:

- Posting and enforcing a plant-wide speed limit of 30 miles per hour;

- Vacuuming of paved areas, in a manner designed to ensure capture of the vacuumed material, at least biweekly.

- Applying a magnesium chloride chemical dust suppressant to unpaved roadways at least bimonthly.

- Watering of unpaved roadways at least daily.

The control measures representing BACT are expressed in the proposed permit as a combination of work practice, monitoring and recordkeeping requirements. The work practice requirements include the four measures listed above. In order to demonstrate that the work practices are achieving the projected reduction in paved roadway silt loading, consistent with the PM_{10} emission rate proposed as BACT and used in air quality impacts analyses (see Section VII herein), the permit also requires periodic measurement of paved roadway silt loadings. Specifically, for paved roadways, the applicant's proposed PM_{10} emission rate is based on a maximum silt loading of 3.3 grams per square meter. The proposed permit requires monthly monitoring to demonstrate compliance with this value. In addition, the applicant is required to submit to the Department for its approval a dust control plan for unpaved roadways. This plan must include the measures listed above, and other measures sufficient to ensure an overall 85 percent control level for unpaved roadway particulate matter emissions.

VII. PROJECT IMPACTS ANALYSES

A. Ambient Air Quality Impacts Analysis

1. General

As noted in Section IV.A herein, PSD regulations under Title I of the Federal Clean Air Act and A.A.C. R18-2-406.A , and the impacts analysis requirements under those regulations, are applicable to the North Star Steel mini-mill for PM_{10}, NO_X, CO, ozone and lead. The impacts analysis is designed to protect the National Ambient Air Quality Standards (NAAQS) and PSD increments.

The NAAQS are maximum concentration "ceilings" measured in terms of the total concentration of a pollutant in the atmosphere. For a new or modified source, compliance with any NAAQS is based upon the total estimated air quality, which is the sum of the background concentrations, the estimated ambient impacts of existing sources of air pollution, and the estimated ambient impacts of the applicant's proposed emissions. A PSD increment, on the other hand, is the maximum increase in ambient concentration that is allowed to occur above a baseline concentration for a pollutant. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment.

2. Modeling Methodology

a. Comparison with PSD and NAAQS Values

Modeling was performed to determine if the source would meet the PSD Class I and Class II increments for NO_2, SO_2, and PM_{10} and the NAAQS for NO_2, SO_2, PM_{10}, CO, and lead. All modeling was conducted conforming to guidance issued by the Department, the U.S. EPA, and the Federal Land Manager (FLM). The modeled emission inventory differed slightly than that presented in Section III herein: the NO_X emission rate representing BACT for the melt shop baghouse and the PM_{10} emission rates representing BACT for the wet cooling towers, as presented in Sections III and IV herein, are lower than those included in the initial PSD permit application submitted by the applicant and in the modeling analyses. Because higher values were used in the modeling, the predicted ambient impacts presented in this section are slightly overestimated, but the Department does not believe that effect of such overestimation warrants a revised modeling analysis.

b. NAAQS and PSD Increment Inventory

Three major sources were modeled as part of the NAAQS inventory: Griffith Energy, LLC ("Griffith"); Mohave Pipeline Operating Company - Topock ("Topock"); and Calpine Southpoint Generating Station ("Southpoint"). The Topock compressor station is an existing source, and the other two are proposed major sources. These sources were included in the NO_2, SO_2, and PM_{10} PSD increment analyses and the full NAAQS impact analysis. The emissions, stack parameters, and locations for these sources are shown in Table VII-A-1.

Table VII-A-1 Major Source Emissions and Stack Parameters

Source Description	UTME (m)	UTMN (m)	Elev. (ft)	Emissions (g/s)				Height (m)	Temp (k)	Vel. (m/s)
				NOx	PM_{10}	SO_2	CO			
Griffith 1	761443	3882516	2486	5.410	3.560	0.7172	12.4	39.6	350	11.9
Griffith 2	761504	3882516	2486	5.410	3.560	0.7172	12.4	39.6	350	11.9
Griffith 3	761553	3882558	2486	0.439	0.024	0.0109	0.262	9.1	422	17.5
Griffith 4	761605	3882510	2486	N/A	0.373	N/A	N/A	18.3	311	8.2
Griffith 5	761631	3882612	2486	N/A	0.091	N/A	N/A	10.7	311	4.9
Southpoint 1	725800	3860854	465	4.300	3.200	0.5610	19.4	68.6	358	13.0
Southpoint 2	725762	3860854	465	4.300	3.200	0.5610	19.4	68.6	358	13.0
Southpoint 3	725708	3860877	465	0.026	N/A	0.0000	0.63	11.0	844	24.0
Southpoint 3	725775	3860854	465	N/A	0.052	N/A	N/A	15.2	322	9.1
Southpoint 4	725740	3860802	465	0.003	0.002	0.0001	0.2	4.6	844	37.1
Topock 1	732125	3845643	1260	0.631	0.030	0.0089	3.84	21.3	561	26.2
Topock 2	732125	3845654	1260	0.428	0.030	0.0089	3.84	21.3	561	26.2
Topock 3	732125	3845666	1260	0.232	0.030	0.0089	3.84	21.3	561	26.2
Topock 4	732125	3845662	1260	0.032	0.005	0.0026	1.21	10.7	697	25.9
Topock 5	732125	3845656	1260	0.088	0.005	0.0026	1.21	10.7	697	25.9

In addition to the three major sources, three minor sources were also included in the NOx increment analysis: Ford Motor Company, El Paso Natural Gas Company - Hackberry, and Guardian Fiberglass, Inc. These sources have been permitted since the NOx baseline date of April 10, 1991, within 57 km of NSSA plant, and were determined by ADEQ to have the potential for contributing significant impacts within the significant impact area. No other minor sources were included in the SO_2 and PM_{10} increment analysis.

Mobile sources were considered for inclusion in the PSD increment inventory. However, emissions of NOx from on-road mobile sources have decreased in the vicinity of the North Star Steel facility with the advent of lower emitting vehicles.

c. Computer Model Used

The Department approved the use of the Environmental Protection Agency (EPA) Industrial Source Complex Short Term 3 (ISCST3) Version (97363). The model was used to quantify maximum impacts from North Star Steel's emissions of regulated air pollutants.

d. Receptor Grid

For purposes of demonstrating compliance with the PSD increment, the NAAQS and AAAQGs, a receptor grid was created with with sufficient density as to capture the maximum model-predicted impact within the surrounding ambient air (inclusive of process area where applicable). Receptor elevations were derived from USGS Digital Elevation Model (DEM) data using the terrain maximizing technique. Using this technique, the elevation selected for a given receptor was equal to the highest terrain value in a box equal in length to the grid spacing and centered on the receptor.

e. Meteorological Data

One year's data from surface observations of winds and temperature obtained from the on-site meteorological monitoring station at the North Star Steel facility were used in accordance with the "Air Quality Modeling Protocol." Data was collected from June 1992 to June 1993. Pasquill-Gifford (PG) stability classes were calculated using the standard deviation of the horizontal wind direction (sigma theta) in combination with observed wind speed and time of day. Data recovery for the period was greater than 99 percent for all parameters. Surface observations were combined with concurrent twice-daily mixing height observations from the nearest National Weather Service upper air station (Desert Rock, Nevada) using EPA's PCRAMMET meteorological data preprocessor to create the hourly meteorological data set required by ISCST3 for modeling.

f. Downwash and Good Engineering Practice

The building wake option was invoked in ISCST3. EPA's Building Profile Input Program (BPIP) was utilized to determine building downwash scenarios. There are three buildings on the facility that will produce building wake effects: the meltshop building, the rolling mill/finish building, and the meltshop baghouse building. All the stacks are subject to downwash. The building locations and GEP analysis were independently confirmed.

g. Background Concentrations

For the NOx, CO, ozone, PM_{10} and lead analyses, the Department approved the use of air quality data collected by North Star Steel in the air quality monitoring program at the North Star Steel facility. Data was collected between June 20, 1993 and June 19, 1994. For SO_2, the Department approved the use of SO_2 concentrations measured at the Riviera, Fort Mohave County monitoring site. Maximum monitored concentrations of these parameters were used in the North Star Steel air quality analysis, as presented in Table VII-A-2 below.

The background 24-hour PM_{10} concentration was increased from the maximum monitored concentration of 66.9 Fg/m^3 to account for growth. Using the growth analysis, an estimated 13.3% increase in vehicle traffic was expected to occur. PM_{10} emissions from these vehicles traveling over roads was assumed to increase proportionally to the maximum background monitored concentration. Hence, the background 24-hour PM_{10} concentration of 66.9 Fg/m^3 was multiplied by a factor of 1.133 to obtain a new background concentration of 75.8 Fg/m^3.

h. Impact Area

In the “Modeling Protocol Document,” the applicant presented an analysis of the significant impact area. Modeling was performed for NOx, CO, SO_2 and PM_{10} for all applicable averaging periods. Isopleths were created for all pollutants and averaging periods for concentrations equal to the modeling significance levels. The distance from the North Star Steel facility to the most distant isopleth is 7.3 km. Hence the significant impact area is circumscribed by a circle with a radius of 7.3 km centered on the North Star Steel facility. The applicant also evaluated the use of a 0.1 Fg/m^3 significance level for annual NOx impacts in a Class I area. The modeling results were less than 0.1 Fg/m^3 significance levels for NOx.

Table VII-A-2 Background Air Quality Concentrations (Fg/m^3)

Averaging Period	NOx	CO	SO_2	PM_{10}	Lead
1-Hour	-	800	-	-	-
3-Hour	-	-	163	-	-
8-Hour	-	400	-	-	-
24-Hour	-	-	35.5	75.8*	-
Quarterly	-	-	-	-	0.0044
Annual	17	-	6.0	12.8	-

Values given are the highest values measured during the monitoring program for the given averaging period. Values for SO_2 are from Riviera, Fort Mohave, Mohave County.

* The background 24-hour PM_{10} concentration is the sum of the highest measured 24-hour concentration (66.9 Fg/m^3) from the monitor and a 13.3% (8.9 Fg/m^3) increase attributed to growth, specifically, the increase in vehicle traveling over unpaved roads.

3. Modeling Results

a. Comparison of NSS Impacts with NAAQS and PSD Increments

Model-predicted maximum offsite concentrations in the Class II area surrounding the plant are presented in Tables VII-A-3 and VII-A-4. Concentrations are compared to both the NAAQS and the maximum allowable incremental increase in air pollutant concentrations occurring over the baseline concentration in Class I, Sensitive Class II, and Class II attainment areas. As shown in Table VII-A-3, for all pollutants, total maximum model-predicted concentrations are less than the NAAQS. Similarly, as shown in Table VII-A-4, for all pollutants, maximum model-predicted model concentrations are less than the PSD increments.

Table VII-A-3 Maximum Air Quality Impacts Due to North Star Steel Sources

Pollutant	Averaging Period	Maximum Project Impact (Fg/m3)	Background (Fg/m3)	Maximum Concentration* (Fg/m3)	NAAQS (Fg/m3)	Location UTME (m)	Location UTMN (m)
NO_2	Annual	20.3	17	37.3	100	765,426	3,894,187
CO	1-hour	5,930	800	6,730	40,000	765,375	3,894,150
	8-hour	1,570	400	1,970	10,000	766,300	3,893,600
SO_2	3-hour	71.3	163	224	1,300	766,200	3,893,900
	24-hour	20.9	35.5	56.4	365	765,388	3,894,123
	Annual	2.82	6.0	8.82	80	765,426	3,894,187
PM_{10}	24-hour	28.3	75.8	104.1	150	765,639	3,892,248
	Annual	7.88	12.8	20.7	50	765,217	3,892,884
Lead	24-hour**	0.435	0.0044	0.435	1.5	765,388	3,894,123

* All concentration values rounded to the significant figures.

** 24-hour modeling results were used to compare to the quarterly NAAQS lead

Table VII-A-4 Class I and II Increment Analysis

Class	Pollutant	Averaging Period	PSD Increment (Fg/m^3)	Modeled Impact (Fg/m^3)	% of Increment	UTMX (M)	UTMY (M)
I	NO_2	Annual	2.5	0.00226	0.10	813057	3967212
I	SO_2	3-hour	25	0.190	0.76	811071	3967445
I	SO_2	24-hour	5	0.0661	1.3	811071	3967445
I	SO_2	Annual	2	0.00240	0.12	811071	3967445
I	PM_{10}	24-hour	8	0.253	3.2	787713	3989587
I	PM_{10}	Annual	4	0.00743	0.19	799010	3973071
S-II	NO_2	Annual	25	0.482	1.9	766070	3875580
S-II	SO_2	3-hour	512	3.07	0.60	767595	3879505
S-II	SO_2	24-hour	91	0.652	0.72	767595	3879505
S-II	SO_2	Annual	20	0.0542	0.27	766070	3875580
S-II	PM_{10}	24-hour	30	1.64	5.5	769570	3880430
S-II	PM_{10}	Annual	17	0.117	0.69	765970	3874130
II	NO_2	Annual	25	20.6	82	765426	3894187
II	SO_2	3-hour	512	70.5	14	766200	3893900
II	SO_2	24-hour	91	21.0	23	765388	3894123
II	SO_2	Annual	20	2.85	14	765452	3894230
II	PM_{10}	24-hour	30	28.3	94	765639	3892248
II	PM_{10}	Annual	17	8.43	50	765217	3892884

b. Comparison with AAAQGs

Modeling was performed to determine if the source would meet the Arizona Ambient Air Quality Guidelines (AAAQG) for 30 air toxics. The applicant modeled emissions of these chemicals from two sources, the meltshop baghouse and the cooling tower, in order to demonstrate that the maximum ambient impacts are below the AAAQGs. This modeling used the same dispersion model, meteorological data, building downwash, and basic model parameters and assumptions used in the criteria pollutant modeling.

Concentrations were modeled for the process area and ambient air, according to Department policy.

Air toxic emission estimates from the meltshop baghouse are composed of heavy metals and metal oxides in the particulate matter passing through the baghouse. Emissions of air toxics from this source were estimated as the baghouse PM_{10} emission rate times the maximum monthly averaged concentration of the toxic compound in collected baghouse dust.

Air toxic emissions from the cooling towers occur as toxic contaminants in the liquid drift lost from the cooling tower. Air toxic emissions were calculated for the cooling tower by multiplying the drift emission rate, the maximum total dissolved solids (TDS) value, and the fraction of each heavy metal in the TDS. The maximum TDS value is based upon analysis of six samples of evaporation pond water quality. The applicant believes that use of the TDS concentration in the evaporation ponds will tend to overestimate the solids concentrations since the evaporation from the pond will continue to concentrate the solids in the evaporation pond water compared to the recirculating water in the cooling tower.

Table VII-A-5 presents the results of the annual AAAQG analysis and Table VII-A-6 present the results of the short-term AAAQG analysis. The modeling demonstrates that maximum predicted concentrations of all air toxics are less than short-term AAAQG values. The evaluation of annual impacts shows that only cadmium (CAS 7440-43-9) exceeds the annual AAAQGs. The annual AAAQG for cadmium is 2.90×10^{-4} Fg/m^3 and the maximum model-predicted concentration is 4.79×10^{-4} Fg/m^3. The applicant asserts that AAAQGs are considered to be very conservative standards, the emission estimate and modeling are conservative, and it is considered extremely unlikely that a person would remain constantly at this location along the property boundary for an entire year to receive this exposure. The Department concurs with this assertion.

Table VII-A-5 Annual AAAQG Impact Analysis for Air Toxics

Maximum Process Boundary Unit Impacts UTM 765,426E 3,894,187N (Fg/m3)/(lb/hr)		Maximum Residential Receptor Unit Impacts UTM 766,020E 3,894,810N (Fg/m3)/(lb/hr)	
Source	Annual	Source	Annual
EASF	0.117	EASF	0.034
Reheat	0.178	Reheat	0.103
CoolTwr	0.0117	CoolTwr	0.0461
From run NSS_I42r.PRT		From Run NSS_I41r.PRT (& 41a, 41b)	

Compound	CAS Number	EASF (lb/yr)	Reheat Furnace (lb/yr)	Cooling Tower (lb/yr)	Process Boundary Annual Maximum Impact (Fg/m3)	Residential Annual Maximum Impact (Fg/m^3)	Arizona AAQG Annual (Fg/m^3)	Process Boundary Compliance with Annual AAAQS	Residental Receptor Compliance with Annual AAAQS
3-Methylchloranthrene	56-49-5	9.28E-04	1.13E-03		3.54E-08	1.69E-08	5.70E-04	OK	OK
Aluminum Oxide	1344-28-1	2.82E+03			3.76E-02	1.09E-02			
Antimony	7440-36-0			4.18E-01	5.58E-07	2.20E-06			
Arsenic	7440-38-2	1.03E-01	1.26E-01	1.31E-01	4.11E-06	2.57E-06	2.00E-04	OK	OK
Barium	7440-39-3	2.27E+00	2.77E+00	4.51E-01	8.72E-05	4.38E-05			
Benz(a)anthracene	56-55-3	9.28E-04	1.13E-03		3.54E-08	1.69E-08	5.70E-04	OK	OK
Benzene	71-43-2	1.08E+00	1.32E+00		4.14E-05	1.98E-05	1.40E-01	OK	OK
Benzo(a)pyrene	50-32-8	6.18E-04	7.56E-04		2.36E-08	1.13E-08	5.70E-04	OK	OK
Beryllium	7440-41-7	6.18E-03	7.56E-03		2.36E-07	1.13E-07	5.00E-04	OK	OK
Cadmium	7440-43-9	3.48E+01	6.93E-01	2.09E-03	4.79E-04	1.43E-04	2.90E-04	Exceeds	OK
Calcium Oxide	1305-78-3	1.17E+04			1.56E-01	4.53E-02			
Chlorine	7782-50-5	2.00E+03			2.67E-02	7.76E-03			
Chromium (total)	7440-47-3	6.20E+02	8.83E-01	2.00E-01	8.30E-03	2.42E-03			
Chromium VI	7440-47-3	2.88E+00	8.83E-01		5.64E-05	2.16E-05			
Copper	7440-50-8	3.64E+02	5.36E-01		4.87E-03	1.42E-03			
Dibenzo(a,h)anthracene	53-70-3	6.18E-04	7.56E-04		2.36E-08	1.13E-08	5.70E-04	OK	OK
Formaldehyde	50-00-0	3.86E+01	4.73E+01		1.48E-03	7.06E-04	8.00E-02	OK	OK
Hexane	110-54-3	9.28E+02	1.13E+03		3.54E-02	1.69E-02			
Iron Oxide	1309-37-1	3.29E+04			4.40E-01	1.28E-01			
Magnesium Oxide	1309-48-4	7.76E+03			1.04E-01	3.01E-02			
Manganese	7439-96-5	4.77E+03	2.40E-01		6.37E-02	1.85E-02			
Mercury	7439-97-6	1.34E-01	1.64E-01	8.35E-04	5.12E-06	2.45E-06			
Naphthalene	91-20-3	3.14E-01	3.85E-01		1.20E-05	5.74E-06			
Nickel	7440-02-0	7.81E+01	1.32E+00		1.07E-03	3.19E-04	4.00E-03	OK	OK
Selenium	7782-49-2	1.24E-02	1.51E-02	2.09E-02	5.00E-07	3.36E-07			
Silicon Dioxide	7631-86-9	7.74E+03			1.03E-01	3.00E-02			
Silver	7440-22-4			8.35E-02	1.12E-07	4.40E-07			
Toluene	108-88-3	1.75E+00	2.14E+00		6.70E-05	3.20E-05			
Vanadium	7440-62-2	9.81E+01	1.45E+00	2.09E-01	1.34E-03	3.99E-04			
Zinc Oxide	1314-13-2	2.24E+04			2.99E-01	8.68E-02			

Table VII-A-6 Short-Term AAAQG Impact Analysis for Air Toxics

Maximum Process Boundary Unit Impacts UTM 765,426E 3,894,187N (Fg/m3)/(lb/hr)			Maximum Residential Receptor Unit Impacts UTM 766,020E 3,894,810N (Fg/m3)/(lb/hr)		
Source	1-hr	24-hr	Source	1-hr	24-hr
EASF	2.81	0.791	EASF	2.83	0.210
Reheat	12.7	0.956	Reheat	4.89	0.452
CoolTwr	1.31	0.124	CoolTwr	1.09	0.312
From run NSS_I42r.PRT			From Run NSS_I41r.PRT (& 41a, 41b)		

		EASF	Reheat Furnace	Cooling Tower	Process Boundary Short-Term Maximum Impact		Residential Short-Term Maximum Impact		Arizona AAQG (Fg/m^3)		Process Boundary Compliance with Short-		Residential Receptor Compliance with Short-	
Compound	CAS Number	lb/hr	lb/hr	lb/hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr	1-hr	24-hr
3-Methylchloranthrene	56-49-5	1.06E-07	1.30E-07		1.94E-06	2.08E-07	9.33E-07	8.08E-08	7.90E-01	2.10E-01	OK	OK	OK	OK
Aluminum Oxide	1344-28-1	8.93E-01			2.51E+00	7.06E-01	2.53E+00	1.88E-01	4.50E+02	1.50E+02	OK	OK	OK	OK
Antimony	7440-36-0			4.77E-05	6.25E-05	5.91E-06	5.20E-05	1.49E-05	1.50E+01	4.00E+00	OK	OK	OK	OK
Arsenic	7440-38-2	1.18E-05	1.44E-05	1.50E-05	2.35E-04	2.49E-05	1.20E-04	1.36E-05	2.80E-01	7.30E-02	OK	OK	OK	OK
Barium	7440-39-3	2.59E-04	3.17E-04	5.15E-05	4.82E-03	5.14E-04	2.34E-03	2.14E-04	1.50E+01	4.00E+00	OK	OK	OK	OK
Benz(a)anthracene	56-55-3	1.06E-07	1.30E-07		1.94E-06	2.08E-07	9.33E-07	8.08E-08	7.90E-01	2.10E-01	OK	OK	OK	OK
Benzene	71-43-2	1.24E-04	1.51E-04		2.27E-03	2.42E-04	1.09E-03	9.42E-05	6.30E+02	5.10E+01	OK	OK	OK	OK
Benzo(a)pyrene	50-32-8	7.06E-08	8.64E-08		1.30E-06	1.38E-07	6.22E-07	5.39E-08	7.90E-01	2.10E-01	OK	OK	OK	OK
Beryllium	7440-41-7	7.06E-07	8.64E-07		1.30E-05	1.38E-06	6.22E-06	5.39E-07	6.00E-02	1.60E-02	OK	OK	OK	OK
Cadmium	7440-43-9	5.30E-03	7.92E-05	2.38E-07	1.59E-02	4.27E-03	1.54E-02	1.15E-03	1.70E+00	1.10E-01	OK	OK	OK	OK
Calcium Oxide	1305-78-3	2.39E+00			6.71E+00	1.89E+00	6.75E+00	5.01E-01	1.50E+02	4.00E+01	OK	OK	OK	OK
Chlorine	7782-50-5	3.73E-01			1.05E+00	2.95E-01	1.05E+00	7.83E-02	6.90E+01	2.30E+01	OK	OK	OK	OK
Chromium (total)	7440-47-3	1.16E-01	1.01E-04	2.29E-05	3.26E-01	9.15E-02	3.28E-01	2.43E-02	1.10E+01	3.80E+00	OK	OK	OK	OK
Chromium VI	7440-47-3	3.29E-04	1.01E-04		2.20E-03	3.56E-04	1.42E-03	1.15E-04	1.10E+01	3.80E+00	OK	OK	OK	OK
Copper	7440-50-8	5.70E-02	6.12E-05		1.61E-01	4.52E-02	1.62E-01	1.20E-02	2.30E+00	7.50E-01	OK	OK	OK	OK
Dibenzo(a,h)anthracene	53-70-3	7.06E-08	8.64E-08		1.30E-06	1.38E-07	6.22E-07	5.39E-08		2.10E-01		OK		OK
Formaldehyde	50-00-0	4.41E-03	5.40E-03		8.09E-02	8.65E-03	3.89E-02	3.37E-03	2.00E+01	1.20E+01	OK	OK	OK	OK
Hexane	110-54-3	1.06E-01	1.30E-01		1.94E+00	2.08E-01	9.33E-01	8.08E-02	5.30E+03	1.40E+03	OK	OK	OK	OK
Iron Oxide	1309-37-1	5.16E+00			1.45E+01	4.08E+00	1.46E+01	1.08E+00	8.30E+01	4.00E+01	OK	OK	OK	OK
Magnesium Oxide	1309-48-4	1.18E+00			3.31E+00	9.32E-01	3.33E+00	2.47E-01	1.50E+02	4.00E+01	OK	OK	OK	OK
Manganese	7439-96-5	7.04E-01	2.73E-05		1.98E+00	5.57E-01	1.99E+00	1.48E-01	2.50E+01	8.00E+00	OK	OK	OK	OK
Mercury	7439-97-6	1.53E-05	1.87E-05	9.54E-08	2.81E-04	3.00E-05	1.35E-04	1.17E-05	1.50E+00	4.00E-01	OK	OK	OK	OK
Naphthalene	91-20-3	3.59E-05	4.39E-05		6.58E-04	7.03E-05	3.16E-04	2.74E-05	6.30E+02	4.00E+02	OK	OK	OK	OK
Nickel	7440-02-0	1.20E-02	1.51E-04		3.56E-02	9.62E-03	3.46E-02	2.58E-03	5.70E+00	1.50E+00	OK	OK	OK	OK
Selenium	7782-49-2	1.41E-06	1.73E-06	2.38E-06	2.90E-05	3.06E-06	1.50E-05	1.82E-06	6.00E+00	1.60E+00	OK	OK	OK	OK
Silicon Dioxide	7631-86-9	1.66E+00			4.67E+00	1.32E+00	4.71E+00	3.49E-01	1.80E+02	4.80E+01	OK	OK	OK	OK
Silver	7440-22-4			9.54E-06	1.25E-05	1.18E-06	1.04E-05	2.98E-06	3.00E-01	7.90E-02	OK	OK	OK	OK
Toluene	108-88-3	2.00E-04	2.45E-04		3.67E-03	3.92E-04	1.76E-03	1.53E-04	4.70E+03	3.00E+03	OK	OK	OK	OK
Vanadium	7440-62-2	1.55E-02	1.66E-04	2.38E-05	4.58E-02	1.24E-02	4.48E-02	3.34E-03	1.50E+00	4.00E-01	OK	OK	OK	OK
Zinc Oxide	1314-13-2	3.76E+00			1.06E+01	2.97E+00	1.06E+01	7.89E-01	3.00E+02	8.00E+01	OK	OK	OK	OK

B. Additional Impacts Analysis

1. Growth Analysis

The applicant proposed that approximately 90 employees and their associated families relocated to the Kingman/Golden Valley area with most living within a 10 mile radius of the plant. The applicant assumed that each of the 90 employees are part of a family of four, yielding a total population influx of 360 people. A review of 1990 U.S. Census Data shows the total population for Kingman and the Golden Valley to be 15,412. Hence, as a result of the North Star Steel facility, the population increased by 2.3 percent.

Increases in air emissions from this population influx are primarily a result of the increase in vehicle exhaust from the family automobiles, as the commercial base of the area is expected to be able to handle this influx without major construction and resulting air emissions.

The applicant provided an analysis of the change in vehicle exhaust emissions due to the change in average daily traffic in the vicinity of the North Star Steel Kingman plant. Although daily average traffic was shown to increase between 1993 and 1997, the emissions of NOx and PM_{10} was shown to decrease due to reductions in emission rates. This statement was confirmed by performing an independent analysis using the MOBILE5a emission model.

However, increases in fugitive PM_{10} emission due to increases in road dust were accounted for in the background concentration. Vehicle traffic was estimated to increase 13.3% resulting in an increase in PM_{10} background concentrations of 8.9 Fg/m^3.

Increases in air emissions from vendors that provide goods and services to the Kingman plant are not significant sources of air emissions. The main contractors associated with the North Star Steel facility are IMS for slag processing, Road Runner for sweeping out trucks, Crown Engineering for monitoring of the water systems, and an off-site rebar bending operation that has no emissions.

2. Soils and Vegetation Impacts Analysis

A.A.C. R18-2-407.I.1 requires that the PSD permit application include an analysis of the impacts that emissions from proposed facility and from secondary growth will have on soils and vegetation. An analysis of acid deposition in the Class I Grand Canyon National Park and in sensitive Class II wilderness areas identified by the Federal Land Manager concluded that adverse impacts due to acid deposition would not occur due to the facility's construction or operation. A separate analysis of impacts on flora and fauna concluded that three sensitive species (one plant, the Arizona necklace, and two animals, the greater Western mastiff bat and Sonoran desert tortoise) exist in the vicinity of the facility. These species will not be adversely affected by the facility's construction or operation.

3. Visibility Impacts Analysis

A.A.C. R18-2-407.I.1 and A.A.C. R18-2-410 require that the PSD permit application include an analysis of the impacts that emissions from proposed facility and from secondary growth will have on visibility. The PSD application included plume blight analyses for sensitive Class II areas identified by the Federal Land Manager as well as regional haze analyses for the sensitive Class II areas and the Class I Grand Canyon National Park.

The plume blight analyses were conducted using U.S. EPA's VISCREEN model. A Level 2 meteorological frequency analysis was conducted following EPA guidance provided in the Workbook for Plume Visual Impact Screening and Analysis. The analysis estimates, by season, the worst-case conditions for each Class II wilderness area. Wind speed and atmospheric stability comprise are the only parameters used to define these conditions. VISCREEN evaluates the potential for a visible plume to occur through a plume perceptibility parameter, Delta E. Under ideal viewing conditions, a Delta E value greater than 2.0 may be indicative of a discernable plume.

The worst-case VISCREEN results are presented in Table VII-B-1 below. The VISCREEN analysis indicates that at Wabayuma, Mt. Nutt, and Warm Springs Wilderness Areas, a plume could be perceptible during stable periods (stability category E and F) and light winds. Plume perception is expected to diminish during the middle of the day when atmospheric stability changes to more neutral conditions (stability class D) and wind speeds increase.

Table VII-B-1 Class II Wilderness Area Plume Perceptibility Results

Wilderness Area	Closest Distance (km)	Season	Stability	Wind (m/sec)	Delta E (sky)
Wabayuma	14	Winter	F	1.5	7.7
		Spring	D	1.5	3.0
		Summer	F	1.5	7.4
		Autumn	D	1.5	3.0
		Daytime	D	1.5	3.0
		Daytime	D	4.0	1.1
		Daytime	C	3.0	0.7
Mt. Nutt	20	Winter	F	1.5	7.6
		Spring	E	1.5	4.1
		Summer	F	1.5	6.1
		Autumn	F	1.5	6.5
		Daytime	D	1.5	1.9
Warm Springs	24	Winter	F	1.5	8.4
		Spring	F	1.5	8.0
		Summer	F	1.5	7.0
		Autumn	F	1.5	7.4
		Daytime	D	1.5	2.1
Mt. Tipton	37	Winter	E	1.5	2.0
		Spring	E	1.5	2.0
		Summer	E	1.5	1.8
		Autumn	E	1.5	1.9
		Daytime	D	1.5	0.9

4. Class I Area Impacts Analysis

The applicant assessed impacts on the following Class I and Sensitive Class II areas: Grand Canyon National Park, Lake Mead National Recreation Area, Havasu Refuge Wilderness, Hualapai Reservation, Mt. Tipton Wilderness, Mt. Nutt Wilderness, Wabayuma Wilderness, and Warm Springs Wilderness. Increment analysis for these areas are presented in Section VII.A.2.a. *Modeling Results - Comparison with NAAQS and PSD Increments*.

a. Regional Haze Analysis

A regional haze analysis was conducted for Grand Canyon National Park, following guidance provided by the National Park Service which relied upon the most recent Interagency Workgroup on Air Quality Modeling (IWAQM) guidance. The results were submitted in a May 7, 1999 letter to Mr. Robert L. Arnberger, the Superintendent of Grand Canyon National Park from Ms. Sara Head and Howard Balentine of ENSR, the applicant's environmental consultants.

Regional haze was calculated by running the ISCST3 model for the one available year of North Star Steel on-site monitoring data (for the period 6/20/92 - 6/19/93). For each day, the fractional change in the extinction coefficient b_{ext} was then computed using the methodology presented below:

1. Run the ISCST3 model, assuming flat terrain, for receptors spaced 2 km along the southern Park boundary. Compute the 24-hour average concentration at each boundary receptor for NOx, SO_2, and PM_{10}.
2. Determine the receptor with the highest 24-hour concentration of NOx for each day. (NOx is the most significant contributor to the source extinction coefficient, and the SO_2 and PM_{10} peak concentrations coincide with the maximum NOx concentration for a given day).
3. Estimate travel time from the North Star Steel source to the Park as the distance to the highest daily receptor divided by the daily scalar-average wind speed for each day.
4. Assume 50 percent relative humidity when adjusting (increasing) assumed nitrate and sulfate particulate mass for relative humidity.
5. Assume the daily conversion rate of NOx to ammonium nitrate to be 20 percent for the summer and 40 percent for the winter. (For spring and autumn, a value of 30 percent was assumed).
6. Assume a 3 percent-per-hour rate of conversion of SO_2 to

ammonium sulfate. Multiply the hourly conversion rate by the travel time to estimate the daily conversion at the receptor.

7. Follow the IWAQM guidance provided by the National Park Service to estimate for each day the total particulate loading, and resultant extinction coefficient, due to the North Star Steel combustion sources at the Grand Canyon National Park.

8. Divide the source scattering coefficient by the appropriate background extinction coefficient for Grand Canyon National Park to obtain the fractional change in extinction coefficient. (The Department provided seasonal 90th percentile background visual ranges for the Grand Canyon National Park to be used in the analysis: 225 km, 209 km, 153 km, and 188 km for winter, spring, summer, and fall, respectively).

9. Rank the fractional change in extinction coefficient for each day during the year from high to low.

10. Report the frequency of occurrence of daily fractional change values above the 5% change level with the understanding that the National Park Service will review the estimated frequency distribution to determine if it constituted a significant visibility impact.

Only three days had fractional changes with greater than 5 percent change. The three values were 8.6 percent, 7.2 percent, and 6.5 percent fractional change. The analysis was verbally deemed "not significant" by the National Park Service on May 24, 1999.

b. Acid Deposition

An analysis of acid deposition in the Class I Grand Canyon National Park and in sensitive Class II wilderness areas identified by the Federal Land Manager concluded that adverse impacts due to acid deposition would not occur due to the facility's construction or operation.

c. Flora and Fauna

Three sensitive species were defined by Arizona Game and Fish Department (AGFD) as occurring within the significant impact area. Sensitive species are defined by AGFD as species classified by the Regional Forester when occurring on lands managed by the U.S. Forest Service. These species include one plant: the Arizona necklace, and two animals, the greater Western mastiff bat and the Sonoran desert tortoise. The applicant demonstrated that air quality impacts from the North Star Steel plant will be below the applicable NAAQS and PSD increments. The applicant states that the secondary NAAQS were established to protect "welfare" which includes flora and fauna. Therefore the emissions from the North Star Steel facility will not adversely impact these species. While the secondary NAAQS are not necessarily protective of sensitive species, Tonnie Maniero of the National Park Service stated that there wasn't any evidence available proving otherwise.

5. Conclusions

The applicant has adequately demonstrated compliance with the NAAQS and PSD increments. Of the 30 air toxics evaluated, only cadmium was not demonstrated to be below the AAAQG, for the annual averaging period only. The maximum model-predicted annual cadmium concentrations was less than twice the applicable AAAQG. It is extremely unlikely that an individual would be continuously exposed to the maximum model-predicted concentration for an entire year. The visibility analysis revealed that a discernable plume would occur at some of the sensitive class II areas during limited periods. Regional haze impacts in the Grand Canyon National Park were deemed "insignificant" by the National Park Service. No other impacts were determined to be unacceptable.

VIII. INSIGNIFICANT ACTIVITIES

The following insignificant activities are present at the North Star Steel Arizona mini-mill facility:

No.	POTENTIAL EMISSION POINTS CLASSIFIED AS "INSIGNIFICANT ACTIVITIES" PURSUANT TO A.A.C. R18-2-101.54
1	Landscaping, building maintenance, janitorial activities
2	Building Air Conditioning Units, including portable air conditioning units and the exhaust vents from air conditioning equipment
3	Sanitary Sewer Vents
4	Batch mixers with rated capacity of 5 cubic feet or less
5	Hand-held or manually operated shop equipment, including but not limited to scrap and billet cutting, portable welders, portable torches, and pressure washer.
6	Parts cleaners
7	Laboratory equipment
8	Aerosol paint cans
9	(1) 1,000-gallon diesel tank & (2) 10,000-gallon lube oil tanks
10	10,000-gallon ethylene glycol storage tank
11	Emergency generator, diesel engine,1500 kilowatt output capacity, Caterpillar Model 3516
12	Emergency generator, diesel engine, 300 kilowatt output capacity, Caterpillar Model 3406
13	(3) Cut-off torch pilots, natural gas-fired, 37,000 Btu heat input per hour
14	Tanks and ancillary outdoor holding reservoirs required by the stormwater retention plan
15	Portable emergency generators of up to 1,750 kW, powered by internal combustion engine(s), used on a temporary basis
16	Boiler, natural gas-fired, 0.495 MMBtu/hr heat input
17	(2) Water heaters, natural gas-fired, 1.48 MMBtu/hr heat input each